SCIENTIFIC AMERICAN

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THE DEMAGNETIZATION OF WATCHES.

BY GEO. M. HOPKINS.

The chances of injury to watches by magnetization have been greatly multiplied by the development of the dynamo and its extensive application to electric lighting and other purposes, so that it is very common to find magnetized watches in the hands of persons having no connection whatever with electrical matters. A watch readily becomes sufficiently magnetized to derange its action and render it entirely unreliable. Proximity to a dynamo is not necessary to accomplish it.

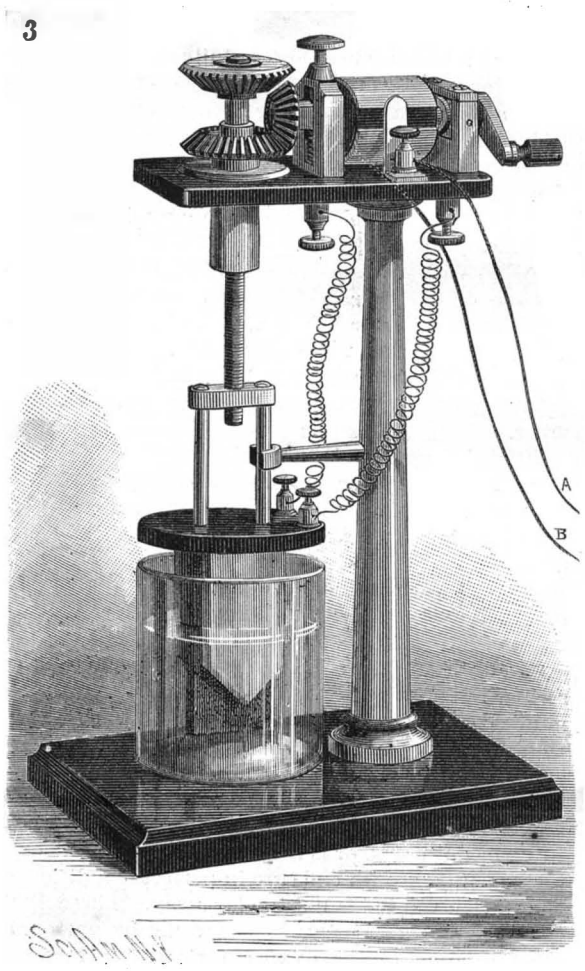
The writer, after faithfully protecting a phenomenally accurate timepiece for years against the damaging influence of dynamos by leaving it behind while visiting lighting stations and other places in which heavy electrical currents were generated or used, suddenly found the watch behaving in a very erratic manner, gaining enormously one day and losing the next; but the strange action was not charged to magnetization, as great care had been taken to avoid it. After a week's stay at the watchmaker's, the timepiece was returned to its owner, together with a bill of five dollars for demagnetization. But for the undoubted integrity of the watchmaker, the bill would have been questioned. The remembrance of the free use of a permanent magnet about the time of the failure of the watch gave reasonable ground for the supposition that the watch might have received its magnetism from that apparently insignificant source. After demagnetization, the watch ran well, but it soon suffered its former fate. This time, however, the watchmaker did not receive five dollars. The writer, knowing the cause of the trouble, effected a cure quickly and without expense.

The remedy in this case is administered on the purely homeopathic principle, *Similia similibus curantur*. If the watch is suffering from an attack of magnetism, magnetism must effect the cure, but much depends on how the curative is applied.

Fig. 1 shows simple apparatus for destroying the magnetism of watches. Fig. 2 is a diagram showing the electrical connections. Fig. 3 represents a demagnetizing machine based on the principle embodied in the apparatus shown in Fig. 1; and Fig. 4 is a diagram showing the electrical connections of the machine.

The simple apparatus consists of a flat coil large enough to inclose a watch, a current-reversing key, or switch, and a plunging battery. One cell of Grenet battery is sufficient. The coil consists of about 225 convolutions of No. 18 magnet wire (Am. W. G.) Its longer internal diameter is 2¼ inches, its short diameter is ¾ inch, and its width is 2¼ inches. The resistance of the coil is 1¼ ohms. Referring to the diagram, Fig. 2, the terminals of the coil, I, are connected with the studs, G H, on which are pivoted the switch arms. The switch arms are pivoted to a vulcanite bar, which maintains a uniform distance between them. To the base, and in the path of the free ends of the switch arms, are secured the contact buttons, E, C, F. The middle button, C, is connected electrically with the binding post, B, and the outside buttons, E, F, are connected with the binding post, D. The binding posts, B, D, communicate electrically with the poles of the battery, A.

The watch to be demagnetized is placed in the coil, and, while the switch arms are swung back and forth at the rate of about one complete excursion per second, the zinc of the battery is slowly plunged and as slowly withdrawn from the battery solution. When the switch arms touch the buttons, C, E, the current passes from the battery, A, to the binding posts, B, D, thence to the



MACHINE FOR DEMAGNETIZING WATCHES.

buttons, C, E, and through the switch arms to the studs, G, H, and coil, I. When the switch arms touch the buttons, C, F, the current passes in the reverse direction through the coil.

The success of the operation depends entirely on the regularity with which the current is reversed and the uniformity with which the zinc of the battery is plunged and withdrawn. A considerable pause of the switch arms on one pair of buttons will exhibit its effect in the preponderance of the magnetism, due to the continued flow of the current in one direction during the pause. An irregularity of this kind will necessitate beginning again.

The watch is tested to ascertain, in the first place whether it is magnetized and in need of treatment of this kind, and afterward to determine whether the treatment was effectual by presenting its different sides to a compass needle or, better, an ordinary cambric needle magnetized and suspended by a single fiber of silk attached to its center. The attraction of the needle by the watch is not positive evidence of its magnetization; but if one end of the needle is attracted by one side of the watch and repelled by the other side, it indicates that the watch is magnetic.

The machine shown in Figs. 3 and 4 has been devised to insure the regular reversing of the current and the uniform plunging and withdrawal of the battery zinc.

The zinc and carbon plates of the battery are suspended by a yoke which is engaged by a screw arranged to revolve in a sleeve supported by the vulcanite plate attached to the top of the column. As the screw is revolved in one direction on the other, the yoke travels up or down on the screw, carrying with it the plates of the battery.

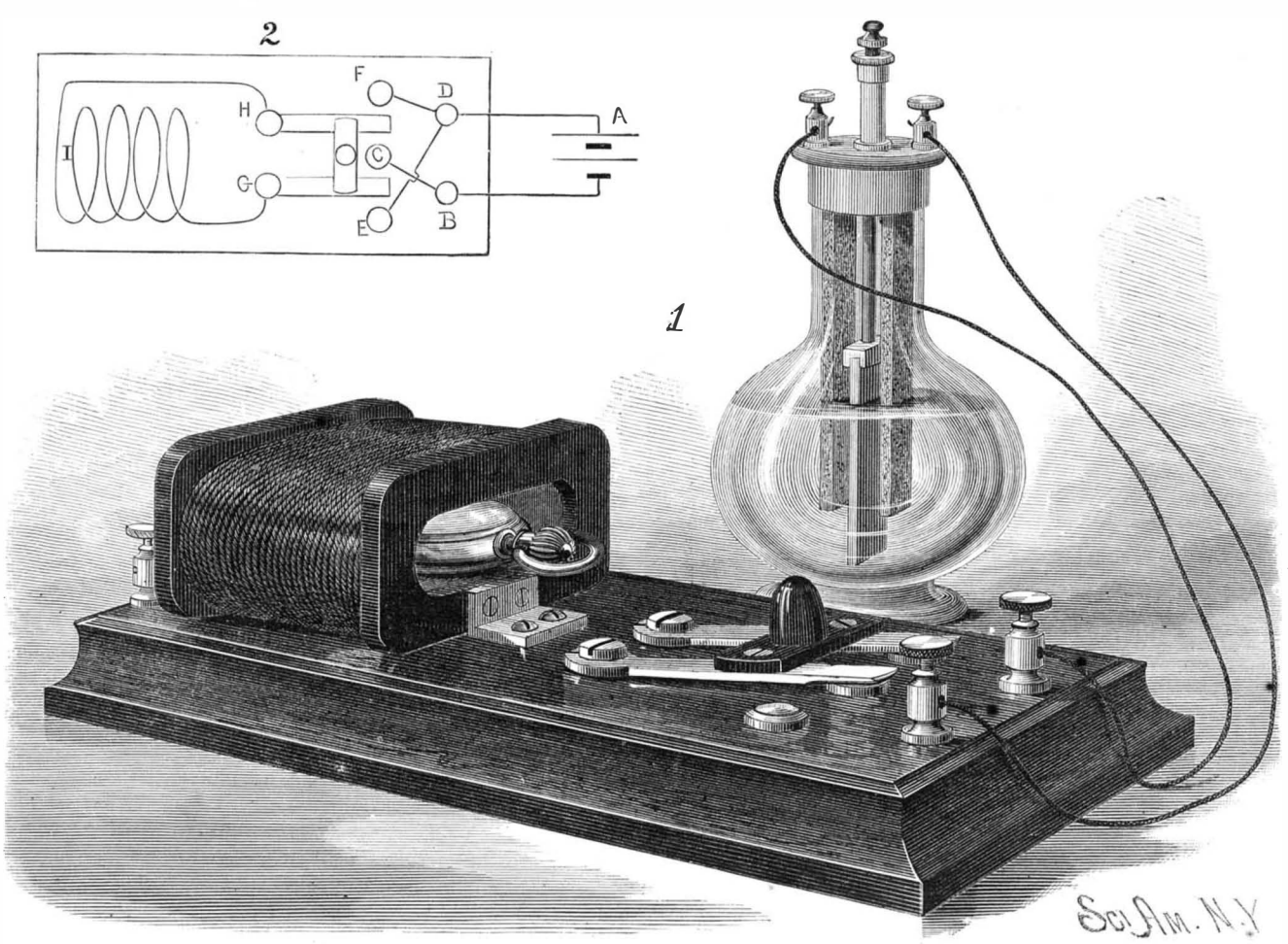
To the screw above its journal are secured two bevel wheels, either of which may be engaged by the pinion on the swinging horizontal commutator shaft.

The commutator is of the kind commonly used on induction coils. It consists of a cylinder of vulcanite mounted on a shaft divided in the middle into two halves, C, I (see Fig. 4), and having on diametrically opposite sides curved metallic plates, D, H; the plate, D, communicating electrically with the part, C, of the shaft, the plate, H, communicating with the part, I. The shaft, I, is journaled in a box pivoted in the standard, J, and is provided with a hand crank at its outer extremity. The shaft, C, which carries the pinion, is journaled in a spring-supported box arranged to slide in a mortise in the standard, B. The spring-supported box is provided with a knob, K, by which it may be depressed. Springs, G, E, which press opposite sides of the commutator cylinder, communicate electrically with a coil, F, like that already described. The current flows from the battery, A, to the standard, B, thence through the shaft, C, plate, D, spring, E, coil, F, spring, G, plate, H, shaft, I, and standard, J, back to the battery. By pressing down on the knob, K, the pinion is brought into engagement with the lower bevel wheel on the screw.

If the crank be turned, the battery plates will be gradually lowered; at the same time, the direction of the current through the coil will be regularly reversed by the commutator. When the plates have been plunged sufficiently, the knob, K, is released, when the spring raises the commutator shaft and brings the pinion into engagment with the upper bevel wheel, and the screw is turned in the opposite direction gradually, withdrawing the plates from the battery solution.

To cause the solution to readily leave the zinc plates, they are made angular at their lower ends. This device also diminishes the strength of the current

(*Continued on p. 212.*)



SIMPLE APPARATUS FOR DEMAGNETIZING WATCHES.

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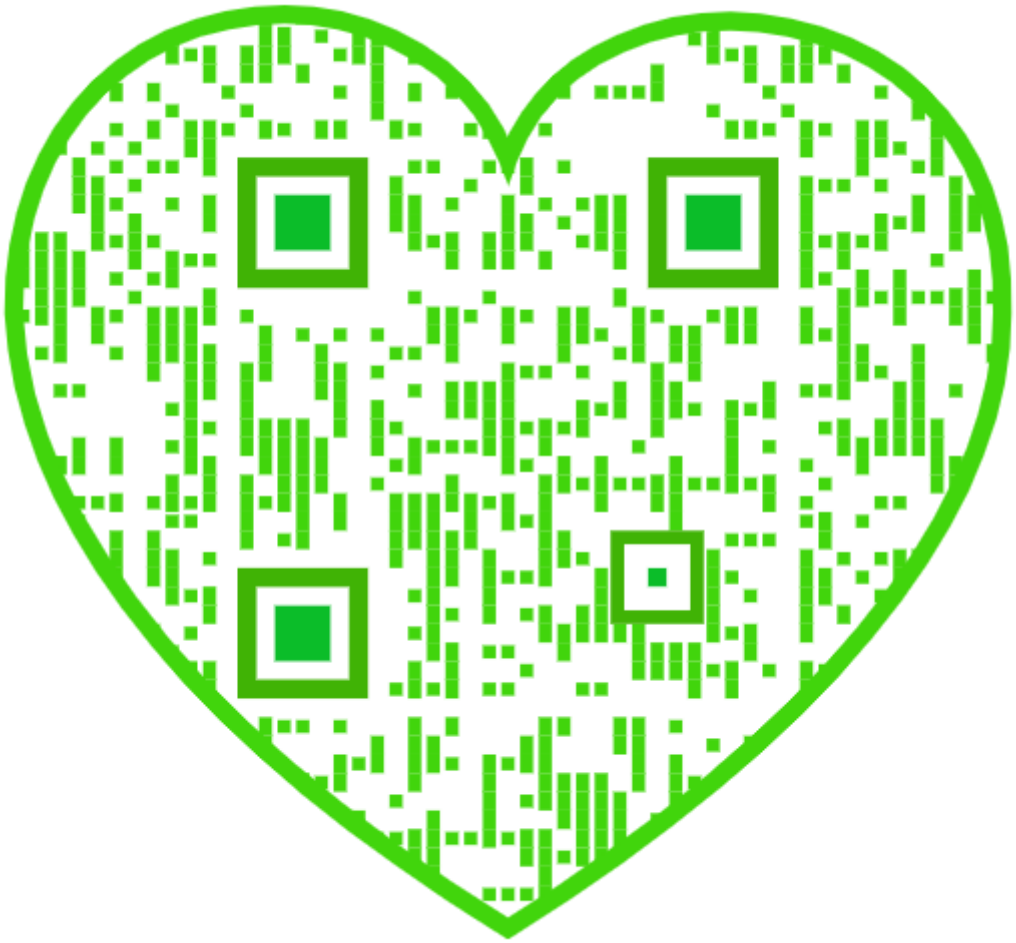

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NEW YORK, SATURDAY, OCTOBER 2, 1886.

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LONG DISTANCE TELEPHONY.

There is a popular belief that the long distance telephone is crowding the telegraph to the wall, and only awaits the expiration of certain contracts to usurp its place altogether; in other words, that the obstacles in the way at present are legal rather than scientific. This seems, however, to be an error, and we turn to a report of the National Telephone Association, recently sitting in St. Louis, to prove the correctness of the assertion. By this we find that while much is being accomplished in long distance telephony at various parts of the country, it has not yet reached a point as to efficiency which may be regarded as wholly satisfactory, nor has it yet proved itself formidable in competition with the telegraph. Long distance telephony may be compared, perhaps not inaptly, with fast time on the railway. It is possible on the railway to make a mile a minute, and still better time is sometimes made both here and abroad, but it has been found undesirable, on economic grounds, to run faster than forty miles the hour. So in telephony 100 miles or thereabout seem to be the paying limit at present, notwithstanding the fact that a line has been successfully operated between New York and Chicago, a distance of nearly 1,000 miles, and several others have been experimented with, each giving more or less satisfaction, according as the conditions under which it was operated were favorable or unfavorable.

The Wisconsin Telephone Company has a line in regular and successful operation 199 miles in length, the Ohio Valley Co. one of 156 miles, the Michigan Bell Co. one of 145 miles, the Great Southern one of 142 miles, and the Central D. & P. Co. of Pittsburg one of 135 miles. But, on the other hand, 12 out of the 19 principal companies do not possess a single line in successful operation which has a continuous length of 100 miles.

What is possible is not always practicable; and though at the present time lines many times longer than those now in use may be operated, the service is so uncertain as to make their construction and maintenance a hazardous venture when regarded from a commercial standpoint. One of the principal speakers before the recent telephone convention, Mr. A. S. Hibbard, of Milwaukee, said:

"In our exchange service we guarantee to each subscriber the means of quick, certain, and successful communication with any other. In our toll line service we would like to guarantee to patrons at each town an equally perfect means of communication with any other town. At present we are obliged to qualify our offers, and can give the perfect service only if the line is not busy, or not noisy, or is free from "cross talk," or the instruments at both ends are in perfect condition and the station wanted is not too far away. These limitations are most confusing to the would-be patron, and must produce in his mind a series of just so many doubts concerning the efficiency of the service, a condition of things certainly detrimental to its popularity. In some localities better results are obtained than at others, but much is yet to be done to make toll line service perfect and popular with the public."

The fact is, that since the last meeting of this telephone convention, a year ago, nothing has been accomplished in the way of preventing, or even lessening, that terrible obstacle in the way of good telephone service—induction. Nor is this attributable to a lack of zeal on the part of telephone men. On the contrary, the most skillful electricians have worked assiduously upon the problem. When they come to better understand the phenomenon of induction, its causes, and how to prevent its appearance, the operation of long distance telephone lines may become commercially profitable, because then the service they give, unlike the present, will be certain and reliable.

Every one who has used the telephone much, knows how troublesome "cross talk" is at times. Indeed, in lines not more than ten miles in extent, if there be parallel wires, a good, clear service is not to be thought of. In this regard, a curious discovery was recently made by one of the speakers at the recent convention. He says that when it is found impossible to work two parallel wires at the same time, if those using one of them will speak German or any other foreign tongue, while those in the other are speaking English, they will have no trouble in making themselves understood.

The Cushman Telephone.

A suit is pending in the United States Circuit Court at Chicago, in which the Bell Telephone Company is the complainant. The defendant is the American Cushman Telephone Company. This company antedates all previous claimants to telephone patents, claiming that Cushman, the inventor, constructed and publicly operated a telephone at Racine, Wis., in 1851. The Cushman patent is claimed to be identical with that of Prof. Bell. The American Cushman Telephone Company was incorporated a short time ago, and set out to manufacture and sell telephones. Immediately the Bell Company filed a bill in the Circuit Court, praying for an injunction.

The answer denies that Bell had ever transmitted articulate speech by the method or with the apparatus now claimed to be covered by his patent. In 1851, the defendants claim, S. D. Cushman constructed and exhibited in Racine an instrument by which articulate sounds were transmitted in exactly the same manner in which Bell accomplished the same thing years later. For three years Cushman's telephones were in public use in Racine, while the inventor endeavored to invent a transmitter which would so magnify the sounds that conversations could be carried on in noisy places. In 1867 and 1868 Cushman explained in public his method.

In support of these claims, the attorneys for the Cushman Company have more than twenty-five affidavits by people who saw and talked over Cushman's telephone in Racine. There are also affidavits from men of high standing to whom Cushman talked in Ohio, and to whom he exhibited his instrument for transmitting vocal sounds by means of electricity.

Welding by Electricity.

According to the *Electrical World*, Professor Elihu Thomson, of the Thomson-Houston Electric Company, has invented a method by which metal wires can be welded together without the application of external heat, but simply by passing strong currents of electricity between the joint of the two pieces to be welded. The apparatus used is exceedingly simple, and consists of a pair of metallic clamps, by means of which the ends of the wires are griped and held so as to touch each other. The clamps are made of heavy section, so as to be good conductors, and are electrically joined by a spiral of a few turns of thick copper bar, which forms the secondary coil of a transformer. The core of this transformer consists of a circular ring of iron wires, and the primary coil occupies about a sixth part of the circumference. It is wound in the same way as the coils on a Gramme ring. A machine producing alternating currents, and a suitable rheostat, by which the strength of the current can be varied, complete the apparatus. Since the secondary coil and the heavy metal clamps present hardly any resistance in the secondary circuit, the current therein is very large, and raises to a high temperature the protruding ends of the wires to be welded, so that, practically, the ends fuse together. Professor Thomson states that his invention is not confined to copper wires, but is also applicable to other metals, viz., German silver, steel, iron, and brass. Some borax or other flux may be used, but it is not essential.

The advantage of electrically welding joints on this principle is that the joints are homogeneous, and of the same thickness as the rest of the wire. Where the conductors to be soldered together are large, as in Edison mains and all mains for direct supply, one of the main difficulties has been that the external heat applied to the joint runs back along the conductor and into the protecting tube almost as fast as it is applied, thus making the operation very tedious. With Professor Thomson's apparatus no such difficulty need be expected, even when joining the heaviest bars, as the heat is localized to the fraction of an inch on either side of the joint. The invention should also be very valuable in joining the ends of steel band saws, as the metal need not be heated along any distance on either side of the joint, thus keeping the temper and finish of the saw the same. When the pieces are very large, Professor Thomson suggests the use of outside heat in addition to the heat applied electrically.

Foods Found by the Chemists of the Massachusetts Board of Health to be Especially Liable to Adulteration.

FORM OF ADULTERATION.

Milk.—Addition of water or coloring matter, and abstraction of cream.

Butter.—Substitution of foreign fats, and addition of coloring matter.

Spices.—Addition of starch and other foreign powders. Especially true of pepper and mustard.

Cream of Tartar.—Substitution of starch, gypsum, and other cheaper substances.

Baking Powders.—Alum and other injurious ingredients. Baking powders have no legal standard, other than that of freedom from harmful ingredients.

Lard.—Presence of cheap fats and oils.

Olive Oil.—Substitution of cheaper oils.

Jellies and Preserved Fruits.—Substitution of cheaper fruits, and addition of coloring matter.

Vinegar.—Absence of the required amount of acetic acid, and addition of coloring matter.

Honey.—Substitution of cane sugar, glucose, and other substances.

Molasses.—Addition of glucose, presence of tin or other foreign substances.

Sugar.—Glucose, poisonous coloring matter.

Maple Sugar and Sirup.—Glucose.

Confectionery.—Terra alba, poisonous coloring matter, fusel oil, arsenical wrappers, etc.

Coffee.—Mixture or substitution of various cheaper substances.

Canned Fruits, Vegetables, and Meats.—Metallic poisons.

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NIGHT SKY—SEPTEMBER AND OCTOBER.*

BY RICHARD A. PROCTOR.

Low down between north and northwest we find the seven stars of the Dipper, the Pointers on the right nearly due north. They direct us to the Pole Star. The Guardians of the Pole, β and γ of the Little Bear (*Ursa Minor*), lie in a direction from the Pole Star corresponding to that of the minute hand of a clock about 17 minutes before an hour. Between the Pointers and the Pole Star we find the tip of the Dragon's tail, and sweep round the Little Bear with the Dragon's long train of third magnitude stars, till we come, after a bend, to the Dragon's head, with the two bright eyes, α and β (part of the Dragon's nose has been borrowed by Hercules). These two stars are almost exactly midway between the horizon and the point overhead, and nearly northwest. King Cepheus—not a very conspicuous constellation—lies between the point overhead and the Little Bear.

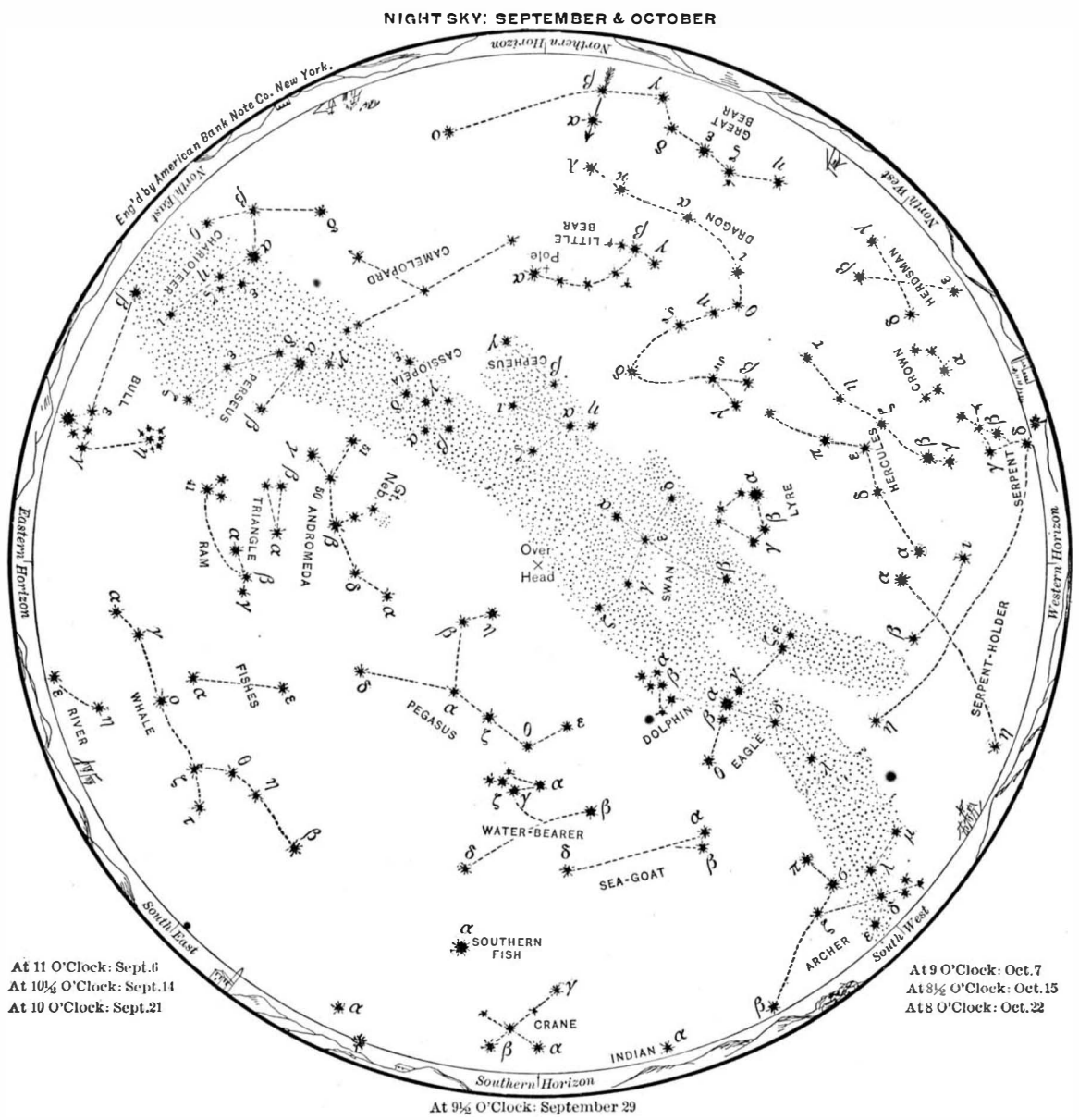
Low down in the northwest we find the head of the Herdsman (*Bootes*). The Crown (*Corona Borealis*), which no one can mistake, lies on his left, and close by is the setting head of the Serpent. Above these three groups we see Hercules—the Kneeler—his head at α, his upraised club by γ. Above the head of Hercules we find the Lyre, with the bright star Vega; and above that the Swan.

Passing southward, we see the Serpent Holder (*Serpentarius* or *Ophiuchus*), beyond whom lies the Serpent's tail, a most inconvenient arrangement, as the Serpent is divided into two parts. Almost exactly southeast, and low down, are the stars of the Archer (*Sagittarius*); while above, in the mid-sky, we see the Eagle (*Aquila*), with the bright Altair. Note the neat little constellation, the Dolphin (*Delphinus*), close by.

Due south is the Crane (*Grus*); above it the Southern Fish, with the bright star Fomalhaut. Above that the Sea Goat (*Capricornus*), and on the left of this the Water Bearer (*Aquarius*); one can recognize his water pitcher, marked by the stars β, γ, and α.

Toward the west, high up, is the Winged Horse (*Pegasus*); he is upside down just now. Below lies the Whale (*Cetus*), or rather the Sea Monster. I have my own notion about Cetus, regarding him as an icthyosaur (but that is neither here nor there). The star *o* of this constellation is called Mira; it is a wonderful variable star. The Fishes (*Pisces*) may be seen between the Whale and Pegasus. Few constellations have suffered more than Pisces by the breaking up of star groups. The fishes themselves are now lost in Andromeda and Pegasus.

Note how on the left of Pisces the Ram (*Aries*) "bears aloft" Andromeda, the Chained Lady (whose head lies at α), as Milton set Aries doing long since. The Triangle serves only as a saddle. Between Andromeda and her father, Cepheus, we find her mother, Cassiopeia, or rather Cassiopeia's Chair. (Of course β, γ, and α mark the chair's back.) Perseus, the Rescuer, lies below; β is the famous variable *Algol*. Below him lies the Bull (*Taurus*), with the Pleiades and the bright Aldebaran. Low down, to the left of the Bull, we find the Charioteer (*Auriga*), with the bright Capella. And lastly, any one who likes may admire the Camelopard (*Camelopardalis*), between the Great Bear, Cephus, and the Charioteer.



In the map, stars of the first magnitude are eight-pointed; second magnitude, six-pointed; third magnitude, five-pointed; fourth magnitude (a few), four-pointed; fifth magnitude (very few), three-pointed, counting the points only as shown in the solid outline, without the intermediate lines signifying star rays.

WILLIAMS & ORTON MFG. CO., Sterling, Ill., write, on the 18th of September, in remitting the payment of a bill for advertisement in SCIENTIFIC AMERICAN:

"Can't keep up with orders for gas engines. Inquiries from SCIENTIFIC AMERICAN inundate us."

This sounds well for the demand for gas engines, and also for the SCIENTIFIC AMERICAN as an advertising medium.

* For details about the various constellations, the reader is referred to the author's "Easy Star Lessons," published by Putnam's Sons.

Heat of Combustion.

The quantities of heat generated by the combustion in oxygen of one gramme of hydrogen and of carbon are stated to be as follows, the unit employed being the quantity of heat which is required to raise the temperature of one gramme of water from 0 deg. to 1 deg. Centigrade: Hydrogen, 33,881, according to Andrews, and 33,462, according to Favre and Silbermann. Carbon—product CO_2—wood charcoal, 7,900 Andrews, 8,080 Favre and Silbermann. The percentage composition of a fuel having been ascertained by analysis, its calorific power can, therefore, be determined by calculation. Thus, in the case of a fuel consisting only of carbon and hydrogen, if we multiply the amount of carbon and the amount of hydrogen by the respective numbers expressing the calorific power of carbon and of hydrogen, and add the products, the sum represents the relative calorific power of the fuel. When oxygen is present in the fuel, a deduction has to be made; and if we assume that it is the hydrogen which is rendered ineffective by combination with the oxygen, then, as in water, the oxygen is combined with one-eighth of its weight of hydrogen, we have to deduct from the hydrogen of the fuel one-eighth of its weight of oxygen. Calculated on the basis of the figures of Favre and Silbermann already given, the evaporation unit for hydrogen is 62·658, and for carbon 14·691.

The Ruby-throated Hummingbird.

(TROCHILUS COLUBRIS.)

This, the smallest of our northern feathered beauties, is about three and a half inches long. His plumage is golden green above, golden red about the throat, purple brown on the wings and tail, and white beneath. All these hues have a brilliant metallic luster, which changes with every movement. Although he is small, he is very brave, and has no fear of any larger bird. He has even been known to alight on the head of an eagle and pull the white feathers out in mouthfuls, while the royal bird goes screaming through the air in unsuccessful attempts to get rid of his small tormentor. The nest is very small, being about an inch and a half in diameter. It is usually placed on the top of a bough, and rarely at the sides of the trunk. The outside is so nicely covered with lichens and bark that it resembles very closely a knob of the tree. The inside is composed of vegetable down, such as that of the downy thistle. The nesting place varies; sometimes an old apple tree is selected as a place of residence, and then again a low shrub in some garden. The eggs, two in number, are pearly white.—*Nat. Companion.*

To Clean Woolen Fabrics.

The *Leipziger Muster-Zeitung fur Faerberei*, which is likely to be good authority on such subjects, expresses its views on cleaning woolens as follows:

Opinions on the best methods of cleaning woolens are so infinitely different, and so various and contradictory are the statements of practical papers on this point, that it appears to me, says the editor, a remunerative and interesting task to examine the matter thoroughly. I tried the various degrees of heat, from the hottest to the coolest temperature, and I employed all the favorite cleaning materials one after the other—soap, borax, ammonia, benzine, and mixtures of these articles. The results were so decided, and so plainly marked, that the following conclusions must be regarded as definitely established:

1. The liquid used for washing must be as hot as possible.

2. For the removal of greasy dirt, sweat, etc., borax is of so little value that its application would be mere waste. Soap lye alone is better, but the preference must be given to soap lye along with ammonia. This mixture works wonders by quickly dissolving dirt from particular parts of underclothing which are hard to cleanse. It raises and revives even bright colors, and is altogether excellent.

3. On the other hand, for cleaning white woolen goods there is nothing which even approaches borax. Soap lye and borax, applied boiling hot, gives white woolens a looseness and a dazzling whiteness which they often do not possess when new.

4. If shrinking is to be entirely avoided, the drying must be accelerated by repeatedly pressing the woolens between soft cloths. In no case should woolens be let dry in the sun, as in this case they become dry and hard. They are best dried in a moderate current of air, and in cold weather in a warm place, not too near the stove.

For colored goods there should be prepared a lye of seven quarts of soft water and two ounces of the best soft soap, the quantities being, of course, modified according to judgment and the dirtiness of the articles. The soap is dissolved over the fire, and the lye, properly stirred up, is divided into two vessels, to one of which is added a teaspoonful of ammonia for each quart of lye. The woolens must be entered at a heat which the hand cannot bear, and the fabric must consequently be turned and pressed with smooth wooden stirrers. They are then pressed out as far as possible, and transferred to the second lye, containing no ammonia, and which by this time has become so cool that the articles can be pressed by hand, but no twisting or wringing must take place. They are then pressed between three or four soft dry towels, till the latter no longer become wet.

For white woolens there is added, instead of ammonia, a teaspoonful of powdered borax to each quart of soap lye, and the operation is otherwise conducted exactly as above described. If the second lye is too soapy, it may be diluted with a little hot water.

After two or three lots of woolens have thus been washed, the lye must be heated again—the first lot being put aside to settle, the second being made first—with the addition of ammonia or borax, as the case may be, and fresh lye made for the second.

International Exhibition in Spain.

An international exhibition, under the auspices of the Spanish government, will be held at Barcelona, from September, 1887, until April, 1888. The exhibition will include all things connected with agriculture, industry, commerce, navigation, electricity, and education. In order to encourage the display of novelties, the government will guarantee the protection of Spain to the exhibitors of inventions capable of being patented, and of drawings, models, and trade marks.

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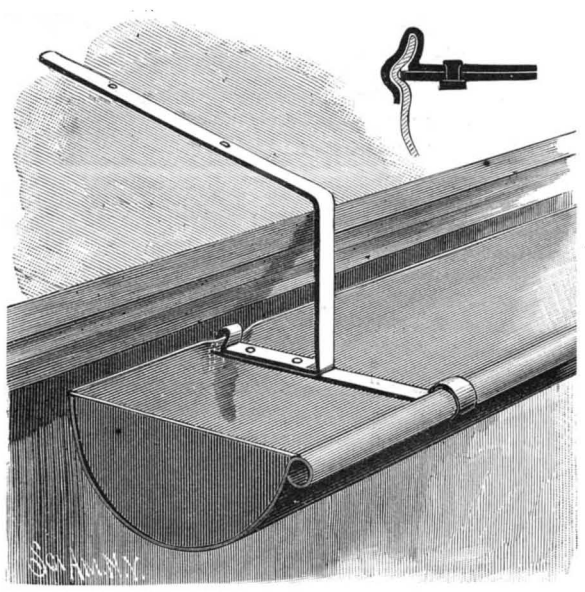
EAVES-TROUGH HANGER.

This invention, which has been recently patented by Mr. Henry J. Hoepfner, of Nelsonville, O., provides a simple and durable eave-strough hanger, by the use of which the usual wired edging of the trough may be dispensed with. The trough is a simple length of tin or other suitable metal, bent so as to be semicircular in cross section. The outer edge is stiffened and strengthened by being bent over upon itself to form a small circle. The hanger consists of a suspending strip, by which the device is secured to the roof, and a cross piece riveted to the strip, which is bent at right angles near its lower

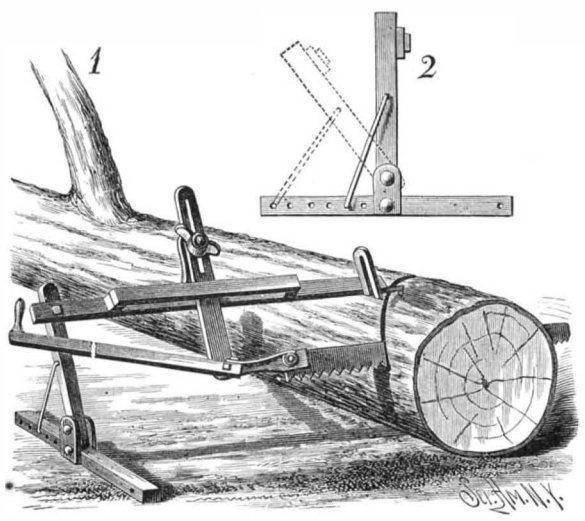


HOEPFNER'S EAVES-TROUGH HANGER.

end. The end of the bent arm of the strip is shaped as clearly shown in the small view, and the end of the cross piece projects so as to force the metal of the trough within the hollow, and firmly clinch it. The opposite end of the cross piece is turned up at a right angle and then bent down and around, to form a partial circle, slightly larger in proportion than the one formed in the trough. The suspending strip is made of soft, pliable metal, so that it can be bent at any point, in order that the operator can regulate the distance from the eaves to the trough. To place the hanger in position, the beaded edge of the trough is inserted within the circular portion of the cross piece and the straight inner edge within the loop, which is then pressed together by means of a pair of pinchers. The trough is then secured to the roof by nails passed through holes punched in the suspending strip.

DRAG SAW.

This drag saw is light and strong, and may be used for light or heavy cutting, both vertically and horizontally and at intermediate angles. The saw blade is connected by a bolt with the lower end of a pendulum bar, through a long slot in the upper. part of which passes a bolt having a wing nut, the bolt also passing through an upright lug on the main bar of the frame. The pendulum bar may thus be held at any desired height, and will be free to swing on the bolt as the saw blade is reciprocated. The side-



GRISWOLD'S DRAG SAW.

wise motion of the pendulum bar is prevented by a guide bar, attached to the main bar as shown. The back end of the main bar is connected by a bolt with the upper end of a post, whose lower end is pivoted to a yoke held to the base. By placing the lower end of a brace rod attached to the post in one of a series of holes in the base, the frame may be inclined to cause the saw to cut at any angle, as shown by the dotted lines in Fig. 2; and, by shifting the yoke toward one end of the base bar, the post may be swung down flat upon the top of the base, when the saw blade will be made to cut in a horizontal plane, for felling trees or similar work. When starting a cut, the blade is guided by a slotted block, fixed to the forward end of the main bar, which is also provided with a dog, which may be driven into the log or tree, to steady the machine while at work. The saw is operated by means of a handle bar, pivoted to the end of the saw stock by the same bolt that holds the stock to the pendulum bar. A spring, secured to the forward end of the handle, bears upon a pin held to the saw stock in front of the pivot bolt, so that, by raising the rear end of the handle, the spring may be made to force the saw downward and cause it to do effective work for the whole length of its stroke. This machine can be easily folded into a small space for storage or transportation.

This invention has been patented by Mr. E. H. Griswold, of Marthasville, Mo.

Heat-Indicating Paint.

The London *Electrical Review* says: "We have just had brought to our notice a new paint, invented by Mr. Henry Crookes, which seems destined to play an important part in machine operations. This paint, which is a brilliant red, has the property of gradually becoming darker when heated, until, at about 160° F., it attains a very dark brown color, and when allowed to cool for a few minutes, it regains its original red. This change of color is not affected by age or use, the paint being as good after one hundred changes backward and forward as when freshly made. The property of indicating a rise of temperature in such a striking manner renders this paint exceedingly valuable to engineers, for, if applied to the bearings of any machine or engine, it will act as a tell-tale of the temperature. As long as the paint remains red, the man in charge knows that the bearings are all right, without having constantly to go round and try them with his hand, while a change of color will warn him that the bearing is getting hot and requires attention. Any of our friends desirous of seeing this property demonstrated may do so by giving us a call, Mr. Crookes having left with us a piece of metal covered with the paint. The change which takes place would, we think, be still more noticeable if a portion of the surface were painted with, say, stripes of ordinary paint of the same tint as the heat-indicating paint when cold. The juxtaposition of the bright red and brown colors would be very prominent."

For the information of our contemporary, we would say that the above invention is not exactly new. It was patented in this country August 26, 1873, by Professors G. F. Barker and Alfred M. Mayer.

The double iodides of mercury and copper, or of mercury and silver, or of similar compounds having the property of temporarily changing their color when exposed to a certain temperature, are painted on cards or suitable strips, and applied to places where it is desirable that a definite limit of temperature should be readily ascertained.

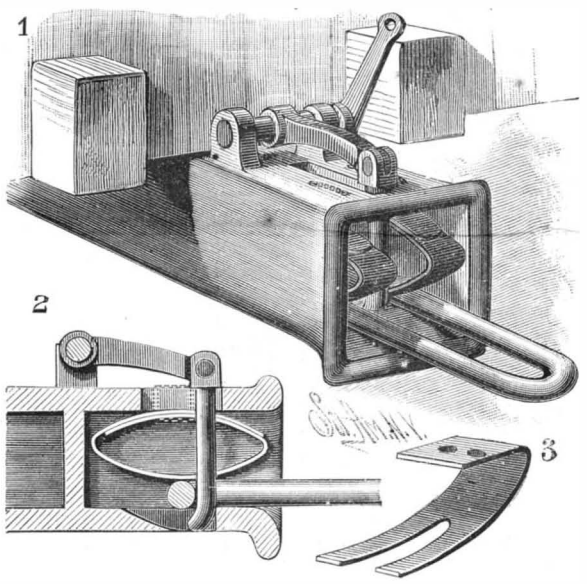
The claim of the patent is as follows: A thermoscope consisting of the application to points where excessive or required heat is desired to be detected or indicated of a substance or compound which will by heat change its color, and immediately on the reduction of the temperature return to its original color, either with or without intervening material, substantially as set forth.

The Artificial Manufacture of Quinine.

A remarkable discovery, by which the price of quinine may be reduced to something like six cents per ounce, says the London *Lancet,* has been made by Mr. Cresswell Hewett. The synthetical manufacture of quinine was first suggested to Mr. Hewett, in 1869, by the late Dr. Mattheson, of St. Bartholomew's Hospital, while giving his assistance in a course of experiments in connection with apomorphia. Subsequently, Professor Parkes, of Netley, aided with his advice, and to these gentlemen, rather than to himself, Mr. Cresswell Hewett modestly explains that the process is due. The importance of this discovery is rendered greater by the fact that while hitherto we have been depending for our quinine on the cultivation of the cinchona tree, from whose bark only about 2 per cent of good quinine can be extracted, 98 per cent being valueless, the drug can now be manufactured without limit by a very simple process from an article which can always be got in abundance in any part of the world.

CAR COUPLING.

The car coupling herewith illustrated is the invention of Mr. George L. Walton, of Bougere, La. Under the bottom of the car is secured a spring drawhead, in the usual manner, and of the ordinary construction. On the interior of the drawhead are secured two elliptic springs, one on each side of the draw-bolt, as shown in Figs. 1 and 2. These springs are secured to the upper side of the drawhead by chains, so that their lower sides may nearly touch or rest upon the bottom of the drawhead and be maintained in position parallel with the head and coupling link. Pivoted to studs projecting from the upper side of the drawhead is a lever to which the bolt is pivoted, so as to be raised to uncouple the connecting link, and lowered to be in position to couple the link by its own gravity. To withdraw the bolt without entering between the cars, a handle is provided, to be operated from the car platform or from the ground. The drawhead is slotted to permit the bolt to have a longitudinal swinging movement from its pivoted end, to allow the coupling link to pass beneath its swinging end and to drop back of its own gravity to a perpendicular position to couple the link. The link is held firmly in a horizontal position by the pressure of the springs on its two sides, so as to enter a

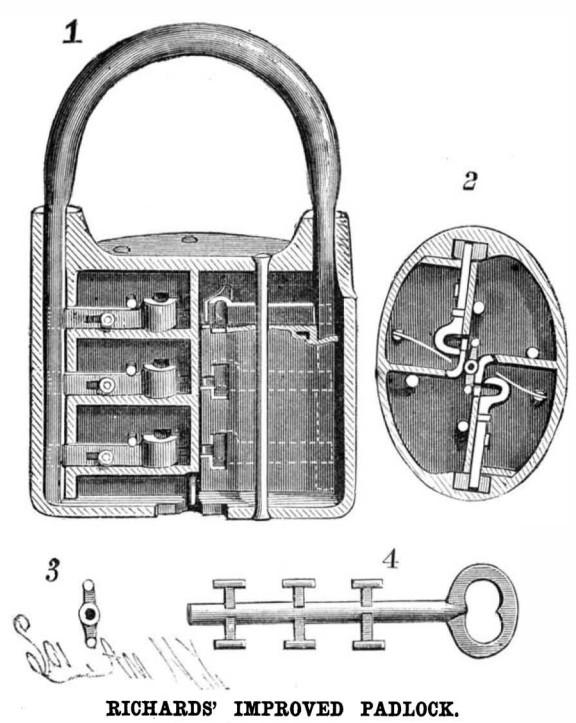


WALTON'S CAR COUPLING.

corresponding drawhead, to be coupled automatically therewith as the two cars approach each other. A single spring, slotted at its lower end and shaped as shown in Fig. 3, may be used in place of the two elliptic ones.

IMPROVED PADLOCK.

In this padlock the shackle is entirely disconnected from the lock when the latter is open. In the bottom of the case is an opening, through which the key is inserted, and upon opposite sides of the case are formed grooves, in which the shanks of the shackle ride. Within the case are arranged two series of bolts, Fig. 1, carried by plates provided with flanges, as clearly shown in the sectional plan view, Fig. 2. Rivets that pass through the case from top to bottom serve as stops to define the positions of the plates. The bolts are formed with elongated slots, through which pass retaining pins, the bolts resting upon horizontal plates, as represented in the first figure, extending between the flanges of the main plates, any upward movement of the bolts being prevented by guiding pins. The inner end of each of the bolts is made in hook form, and the bolts are normally held forward by springs. The



RICHARDS' IMPROVED PADLOCK.

key, Figs. 3 and 4, is provided with as many bits as there are bolts. The key shank is hollow, in order that it may ride over or receive the key spindle. Just opposite the hooks of the bolts, the main plates are formed with appropriately shaped openings to admit the bits. When the key is inserted in the lock and turned, its bits pass through the openings and engage with the hooks of the bolts, which are withdrawn from the apertures in the shackle, which may then be removed.

This invention has been patented by Mr. William J. Richards, of Coaldale, Pa.

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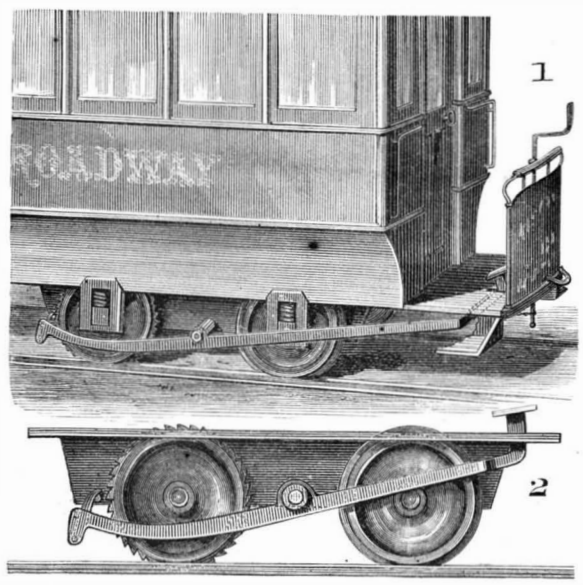
IMPROVED CAR STARTER.

The accompanying engraving represents an invention the object of which is to provide a simple and efficient device by means of which the driver may assist the horses in starting the car. Pivoted upon a stud projecting from the car truck is a lever, which extends forward, and is bent so as to come within convenient reach of the driver. Upon a stud projecting from the inner face of the widened opposite end is placed a pawl, adapted to engage ratchet teeth formed in the flange of one of the wheels, as represented in the engraving. The lever carries a stop pin, that prevents the pawl from being thrown over the center of the stud, and a pin projecting from the side of the truck prevents the pawl from engaging the ratchet teeth when the pawl end of the lever—which is heavier than the other—drops down. When it is desired to bring the pawl into engagement with the teeth, the pressure of the driver's foot on the pedal carries that end of the lever down and raises the pawl end, bringing the pawl into engagement with the teeth and thereby exerting a pressure upon the periphery of the wheel, which tends to propel the wheel forward and assist the horses in starting the car.

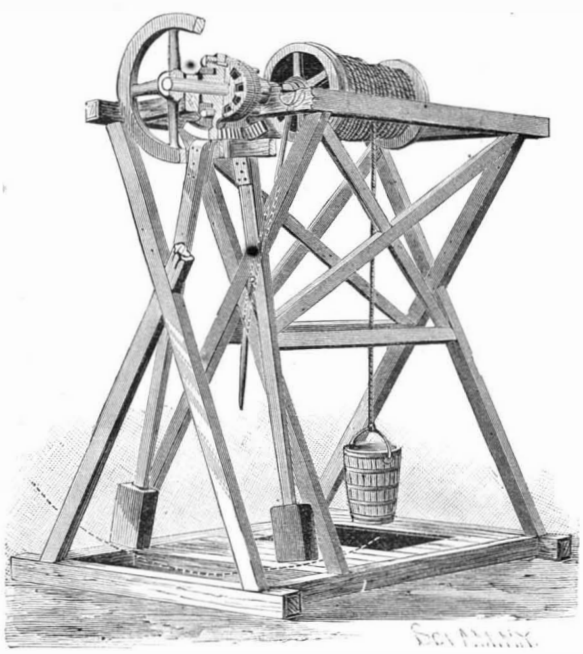


GERCKE'S CAR STARTER.

This invention has been patented by Mr. Rudolf O. Gercke, of Augusta, Ga.

PENDULUM HOIST.

The object of the invention here illustrated is to provide a simple, cheap, and durable hoisting apparatus. Mounted upon the main frame is a shaft carrying a loosely mounted drum, a balance wheel, and a fixed collar, each vertical face of which is formed with ratchet teeth. Upon each side of the collar there is arranged a disk formed with a segmental rack and a downwardly extending arm to which a pendulum is attached. Meshing with each of the segments is a beveled pinion, mounted in a sleeve carried by a bracket fixed to the stationary frame. The disks are provided with pawls that are forced outward against the ratchet teeth of the collar by springs, the number of pawls being one less than the number of teeth. The motion of the shaft is imparted to the drum by a properly arranged clutch, which may be thrown into or out of gear by a lever. Attached to the drum is a brake, by means of which its motion may be regulated.



SATTES' PENDULUM HOIST.

To operate the hoist, one of the pendulums is started, the force applied to it being gradually increased until it swings in the arc required. Any force exerted upon one pendulum will be transmitted to the other, owing to the connection established between them by their segments and the interposed pinion. As the pendulums swing, their pawls engage with the ratchet teeth of the collar—the pawls of course failing to engage during the return stroke—and impart a constant rotary motion to the shaft and, when necessary, to the drum. If desired, the balance wheel may be left off.

This invention has been patented by Mr. John Sattes, whose address is P. O. box 730, Butte City, Montana.

Jamison's Cream and Milk Radiator.

This is the name that has been given to a construction designed more especially for regulating the temperature of water in milk vats by introducing steam in such way that no noise is made. The vats or tanks are such as are usually employed in creameries, and within them are set tin milk vats, which are surrounded by water to the requisite height. Into the lower portions of these outer vats are inserted suction and discharge pipes, controlled by a connecting pipe and valves, and also in connection with a steam supply pipe, through an injector. By this means a perfect circulation of the water in the vats is obtained, the water being heated by the steam to any desired degree. At one end of the connecting pipe is a valve, by which the apparatus can be made to operate as a steam pump to throw either hot or cold water to any part of the building, or for use in cleaning the churns or other vessels. This invention has been patented by Mr. Samuel S. Jamison, of Saltsburg, Pa.

THE ALLARD SPIRAL SCREW DRIVER.

This screw driver is especially adapted for light and rapid work, and much time can be saved by its use where large quantities of small screws are to be driven. Placed upon the spirally threaded shank within the lower end of the hollow handle is a nut which is free to revolve within the handle. When the point is inserted in the nick of a screw and pressure is brought to bear upon the handle, this nut is raised slightly and brought into engagement with a clutch, which holds it so that continued pressure upon the handle revolves the shank and thus drives the screw. To draw a screw, the shank is pressed into the handle, when the tool can be used as a common screw driver. If desired, it may be used, when extended, as a common screw driver, by simply giving the shank a twisting jerk, causing the nut to recede and become locked.

It will be seen that the use of this tool does away with all tiresome turning of the hand and twisting of the wrist, all the work of driving the screw being accomplished by simply pushing.

The sole agents of this screw driver are the Alford & Berkele Co., of 77 Chambers Street, New York city.

Photos for Photo-Engraving.

Objects which are to be reproduced by means of the photo-engraving process are generally photographed, in an enlarged measure, and drawn upon with India ink. Then the photographic picture is removed by means of bleaching, so that only the drawing remains, and is reproduced by photographic means to the size desired.

As is known, one of the chief requisites for its proper chemical reproduction is that it should exhibit deep black lines and a pure white ground. By the usual method of bleaching photographic prints with chloride of quicksilver, it often happens that, in spite of every precaution, the whites of the picture appear yellow or brownish yellow, a circumstance which greatly increases the difficulty of making a proper negative. To overcome this fault, Mr. W. Bode recommends the following receipt:

Distilled water	9 parts.
Nitrate of silver	1 part.

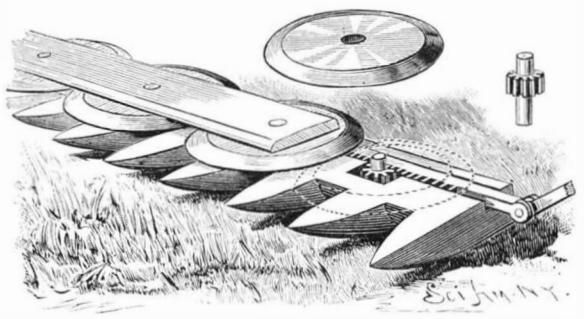
When the silver has dissolved, pour three parts of the whole into a glass, and add ammonia to it until the oxide of silver which has formed dissolves, and the solution becomes once more clear. Then pour this back into the other six parts. If oxide of silver forms again, it can be run off from the bottom of the vessel, or it can be poured out and filtered. Use only good salted paper. Print until all the details are out, yet not too deep, then wash the print with cold water until it is red. When the residue of silver is completely washed out by frequent changes of water, the print must be fixed in a solution of soda, say equal parts of hypo and of double carbonate of soda. Let it stay in this solution ten to twelve minutes, then wash it many times in clear water and then mount it.

Since the picture will only keep for a few days, the drawing should be made as soon as the print is dry. The bleaching material—a solution of thirty grains of chloride of quicksilver in one liter of alcohol—should be poured over the picture in the same way as collodion. In a quarter of an hour the drawing can be had on pure white paper, which does not show a vestige of a photographic picture.—*Archiv. Phil. Photographer.*

CUTTING APPARATUS FOR MOWERS AND REAPERS.

In this cutting apparatus for mowers and reapers the finger bar is substantially like that of the usual form, except that it is enlarged at intervals along its length to form chambers for receiving pinions, and is provided with a longitudinal groove for a rack which engages all the pinions. Secured to the top of the finger bar is a plate provided with bearings which receive the shafts of the pinions and cutters. This plate also confines the rack in its place. The guards formed on the finger bar project outward under the circular cutters to protect them from injury and to divide the grain stalks and hold them in position to be operated upon by the cutters.

The rack is reciprocated by a pinion attached to one end, the stroke being sufficient to cause the cutters, by the engagement of the rack with the pinions, to make a half revolution in each direction. When one-half the cutting edge has become dulled, the cutters, may be removed and turned half way round to bring a new edge into use. When dulled, the cutters may be ground upon an ordinary grindstone, and when worn out may be easily replaced by new ones. The circular knives produce a true drawing cut, which readily severs the grain stalks with the smallest consumption of power and with but little wear upon the cutting edges.

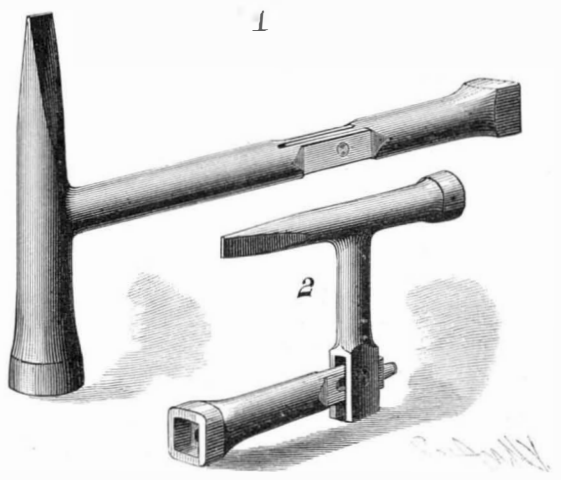


KELLER'S CUTTING APPARATUS FOR MOWERS AND REAPERS.

This invention has been patented by Mr. David M. Keller, of Raphine, Va.

COMBINATION TOOL.

This tool consists of a socket-wrench, hammer, and screw driver, and is especially adapted for the use of stove assemblers and repairers. The body of the tool is formed with a T-head or handle portion, one extremity of which is in the shape of a screw driver, while the other forms a hammer head. The lower end of the body is forked and formed with a socket; between the forks is placed the wrench portion, the body of which is cut away to form a shank and shoulder, as shown in Fig. 2. The shank is provided with a long slot, through which and the forks passes a rivet, and the top of the shank is formed with a lug which enters the socket in the handle, thereby holding the wrench portion rigidly in the handle when used as a straight socket-wrench. The lower end of the wrench is formed with a square nut-receiving recess, and a cylindrical socket to receive the screw-threaded end of the bolt. When arranged as shown in Fig. 1, the tool may be used as a screw driver, a hammer, or a straight socket-wrench, and by drawing the wrench portion down and turning it one side or the other (Fig. 2), a wrench is formed for the purpose of getting at nuts up under flanges and other inconvenient places. To bring the tool to the first position, it is only necessary to swing the wrench in line with the body and push it up into the forks, the lug then entering the socket. If desired, the lug may be formed and used as an ordinary punch for perforating sheet metal or for heading rivets.



MANDEVILLE'S COMBINATION TOOL.

This invention has been patented by Mr. Ira J. Mandeville, of Hazleton, Pa.

THE time which would be taken to discharge 500 gallons of water through a 1½ inch pipe 700 yards long, with a fall of 100 yards from inlet to outlet, is theoretically 16 minutes; but any inequality in the inside of the pipes, or minute obstructions, would increase the time.

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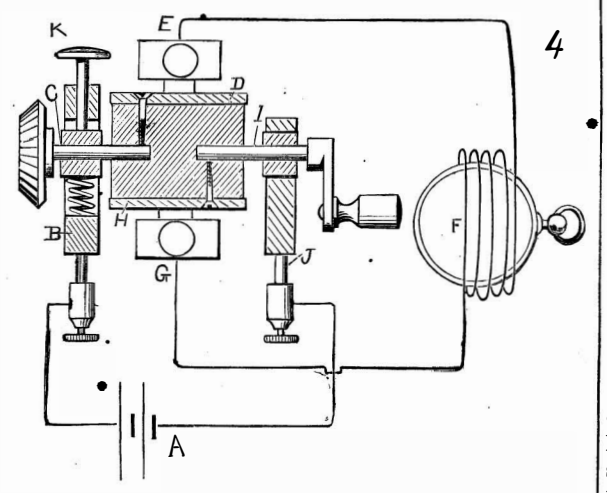
THE DEMAGNETIZATION OF WATCHES.

(*Continued from first page.*)

as the zincs are withdrawn. The connection between the battery and the standards, B, J, is made by means of spirals to permit of the free movement of the battery plates. The binding posts attached to the commutator springs are connected by wires, A, B, with a coil like that shown in Fig. 1.



ELECTRICAL CONNECTIONS OF THE DEMAGNETIZING MACHINE.

If the first treatment of a watch does not entirely demagnetize it, the operation should be repeated without plunging the battery plates deeply.

Protection of War Ships with Rubber.

The experiment which lately took place with the Resistance at Portsmouth is important, and deserves notice. The necessity for thickening armor in order to meet the rapidly increasing power of ordnance led to the consideration as to what parts of the ship might be left without armor without actual danger to her existence or efficiency as a fighting machine. Hence certain portions, such as the water line amidships, the magazines, engines, sufficient hull to secure the vessel remaining afloat, and principal guns have been included in the category of so-called vital parts, and have been protected by vertical or horizontal armor, while other portions have been allowed to take their chance with thin armor, or nothing more than the thin steel or iron side of the ship. This system of construction, says the *Engineer*, led to the development of quick fire attack, carried on by guns loaded by hand, but supplied with fixed ammunition, that is, ammunition in which charge, projectile, and cap were contained in a single metal case, as in small arm cartridges. By this means, coupled with arrangements for bringing the gun back into position after recoil, 6 pounder and 3 pounder guns can be fired very rapidly. In fact, a rate of seventeen rounds a minute without aiming, or twelve rounds taking aim, can be maintained for some time; consequently, unarmored or slightly armored parts of a ship may be cut away at a rate which endangers her safety. For while a few rounds even from large guns might not cause intolerable inconvenience, the destruction of the sides by quick fire, which might be applied to nibble the structure rapidly away just at the most important parts, might, it is thought, quickly endanger the ship or reduce her to impotency by hampering her movements. Large holes, well forward and near the water line, for example, would cause water to enter freely when the ship moved quickly. This, at all events, has been strongly urged. Captain Fitzgerald, in a paper read at the United Service Institution on January 21, 1885, argued that the Hercules by this means could disable the much more formidably armed and more modern Italia before the latter could fire her four 100 ton guns more than once. Captain Fitzgerald, we believe, has subsequently advocated strongly the employment of India rubber for unprotected parts of ships. Preliminary experiments appeared to show that a thick sheet of India rubber would close up after a machine gun or even a quick fire gun bullet had passed through it, so as to prevent the entrance of water. Asbestos and cork have been similarly used under the appellation of contrivances. This is the question which was tried at Portsmouth on August 26. The Resistance was anchored in St. Helen's Roads, in 5½ fathoms of water, with 300 tons of ballast to give her a list to starboard. The India rubber sheets, of various thicknesses, were fixed inside the vessel, divided into compartments numbered from 1 to 4, on the port side, which was heeled up out of the water. The Pincher fired two rounds of steel shells from 6 pounder quick firing gun, which passed through No. 4 compartment, "tearing into shreds the India rubber," which was placed at 3½ feet from the ship's plates, and passing through two bulkheads, splintering the wood in all directions. The Blazer then fired with 5 inch breech loading common shell weighing 50 pounds. In No. 3 compartment, where the India rubber was only ½ inch thick, it was torn away, the shell smashing the bulkheads in the rear, but not passing through the ship. A clean hole was made in the ship's plate. Two more similar shells were fired through 1 inch India rubber, and two through 1½ inch; 6 inch gun shells were afterward fired through 1½ inch India rubber. On righting the ship, water entered the holes so fast that they had to be plugged to prevent the vessel from sinking. The Pincher then fired her 6 pounder quick firing gun against a part of the Resistance's hull which was covered outside with India rubber, and another part lined with asbestos 14 inches thick, supported by a thin steel plate. Seen from outside, it appeared as if little damage had been done; but the shots had passed in through the India rubber, carrying debris with them, and water poured in freely. The asbestos closed up behind the shot.

The most important part of the trial is the action of the 6 pounder quick firing gun shell, for the reason given above—that it is by quick fire that destruction to unarmored parts of ships is threatened. The larger shells could hardly fail to cause leakage, but they can only be delivered comparatively slow. It was hoped that the remarkable action of closing in of the India rubber might have been effectual in keeping out water; but it is not surprising that this should not be the case under any great pressure of water. The results are thought sufficiently discouraging to prevent further trial at present.

NEW ORLEANS.*

On the twentieth of December, 1803, France ceded Louisiana to the United States, and New Orleans became American. Despite the eighty-three years that have passed, the influence of the French character is still very manifest in this great city, which now numbers more than 216,000 inhabitants, of which about 20,000 are compatriots of ours.

The gayety and bustle that prevail in the streets have not the same character as in the other cities of the United States, and in certain quarters one might almost believe that he was in a French land.

Moreover, our language is still extensively spoken here, the ordinances and handbills are to-day translated into French, and the inhabitants of the low quarters of the city would not find it convenient to remain there without being familiar with our tongue.

A large number of streets still bear French names, and the same is the case with the merchants' signs.

It is also observed that the old colonists, the representatives of France in this city, have left marked traces of themselves here, but these are gradually disappearing, day by day, and will doubtless soon be destroyed forever.

If there is any port in the world of strange and picturesque aspect, it is that of New Orleans.

From September to December, an army of laborers—negroes and mulattoes—is employed in gathering the cotton crop in the interior of the State.

The railways, and especially the steamboats, carry immense loads, and business receives a great impetus.

The steamboats, like floating fortresses with walls formed of bales of cotton, come from all quarters, and deluge the wharves and storehouses with the harvested crop. These vessels will sometimes carry 5,000 or 8,000 bales or more. One of them, the Henry Frank, which is 300 feet in length, and of 2,600 tons burden, made a sensation on the wharves on April 20, 1881, and her captain received an ovation because of her extraordinarily heavy cargo. This consisted of 9,226 bales of cotton, 1,213 bags of cottonseed, 1,224 bags of oil cake, 500 bags of various grains, and 27 packages of different kinds. The whole may be estimated as equal in weight to 10,226 bales of cotton. Up to that time a steamer of this kind had never been known to carry so heavy a cargo.

Our engraving represents a steamer analogous to the one just mentioned, the E. D. Richardson, which, as may be seen, is unloaded.

The method of loading is curious. Throughout nearly the entire length of her deck the steamer is provided with an immense central saloon for passengers, at the sides of which are staterooms for the accommodation of more than two hundred persons, and various rooms for the service, and so forth. This saloon gets light from a covered gallery, which serves also as an external promenade. The next deck is constructed in the same way, and this is surmounted by a third, all three of them being elegantly decorated. On a level with the main deck a wide platform, supported here and there by the iron beams that form part of the structure of the grand saloon and staterooms, increases the general surface of the steamer. The one on the Henry Frank is 55 feet in width. It is upon this platform that are placed the cotton bales, these being gradually piled up on it in such a way as to entirely hide the passenger saloons. Care is taken to preserve embrasures between the bales for the entrance of air and light to the interior. When the loading is finished, the bales of cotton fill all the side spaces of the steamer and extend to the upper promenade deck.

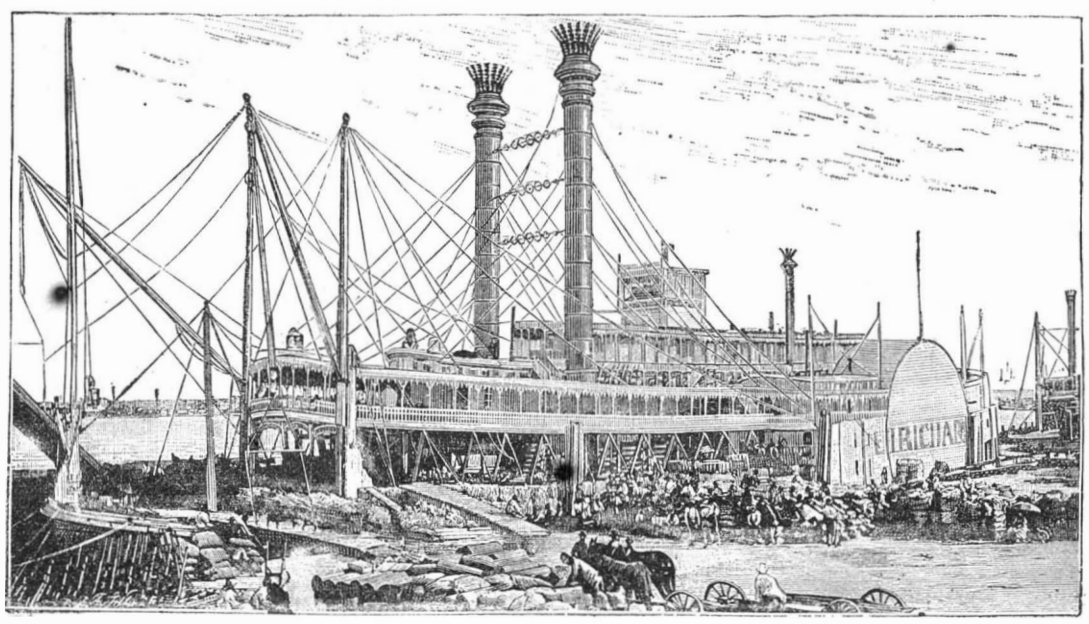
The weight of all these bales (averaging 450 lb. each) causes the boat to sink so that the water nearly reaches the first row upon the platform, and often wets it, through the vessel's motions.

After the cargo has been discharged upon the wharf, merchants come to make their purchases, and the bales are at once sent to the cotton presses to be reduced in size. One of the characteristic sights of the city is the quarter where the vast pressing establishments are situated. There are nearly twenty-five of these in New Orleans, each of which cost about a hundred thousand dollars to fit up. They contain a large number of presses of different styres, but the ones most used are Taylor's Hydraulic and the New Morse. The latter have been the favorites since 1877. There are over fifty of them in the city, while there are only about thirty of the Taylor. Mr. Morse, the inventor, has manufactured a large number of models since 1872, but his last apparatus, the New Morse, seems to combine all the qualities of economy, strength, and power. Many of these apparatus have already pressed from 500,000 to 1,000,000 bales without having undergone any wear and tear. It is curious to watch the machine while in operation. The bale of cotton is picked up by negroes, who put it into the press, which is at once set in action. The press flattens the bale, through its formidable weight of five million pounds, and reduces it by nearly three-quarters of its original dimensions. Covered with coarse sacking, the bale is bound with strips of sheet iron that are passed through apertures formed with this intent in the compressing plates. These iron bands are then fastened by the workmen, and the machine ejects the bale automatically, in order to receive another.

These wire bands are a great improvement upon the rope that was formerly used for the same purpose. They were invented and further simplified by Messrs. L. Miller and S. H. Gilman. It is a great advantage for the steamers to have the bales pressed, as they can thus carry a much larger number of them, and so they pay a fee of 65 cents per bale. About two million bales are annually exported.

Two-thirds of the city's population are occupied in this trade. The value of the exports may be estimated at $100,000,000 per annum.

One of the most important questions to be decided, upon the subject of presses, has been as to



A MISSISSIPPI RIVER STEAMBOAT.

* Extract from "Letters from America," by A. Tissandier, in *La Nature*.

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whether the quality of the cotton always remains the same after the bale has been pressed. It has been generally asserted that the cotton does not spin so well after it has been pressed, and that its quality is then inferior to that which has not been. The manufacturers of the Northern United States have been of this opinion; but, from a paper published by Mr. J. C. Hemphill in Special Report No. 47 of the Department of Agriculture, it will be seen that this opinion is not shared in England. Ideas have completely changed on this subject in that country, in consequence of some experiments performed upon cotton derived from Eastern India. On another hand, Mr. Dumont, a large manufacturer of Gaston County, in South Carolina, appears to have demonstrated, after many trials made with best kinds of cotton, that, far from diminishing the quality of the cotton, presses, on the contrary, improve it. He was surprised to find that there was less waste with pressed cotton, and consequently a greater product, and that thread made from unpressed cotton was perhaps stronger, but that that made from pressed was superior in lightness and evenness —two qualities that are now regarded as among the most important.

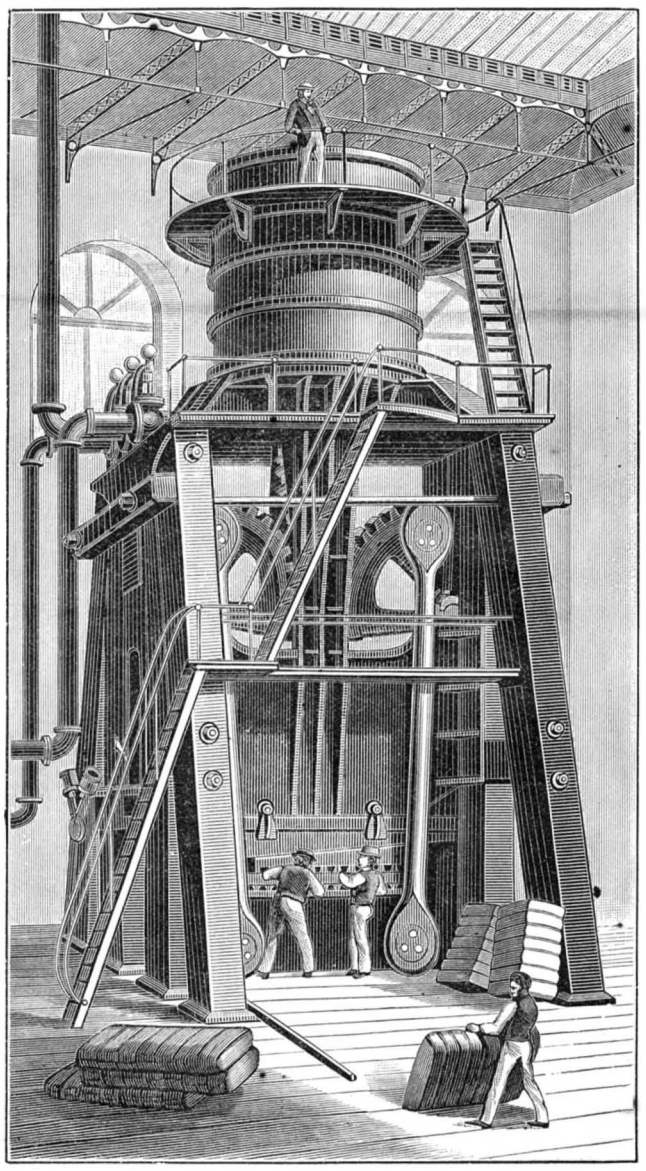
New Orleans is one of the chief ports of the United States. The Mississippi is here superb. In order to reach the mouth of the river, in the Gulf of Mexico, it requires a trip of about two hours; but the panorama that spreads out before one's eyes during this time is so interesting, with all its varied aspects, that no monotony can exist.

In its lowest parts, the river is about one hundred and fifty feet in depth, and ships often come near the shore; but the route that they have to take varies with the season, the channel being sometimes in the middle of the stream, and sometimes at the sides. But the route followed is always imposing, and the windings are numerous. The land is covered with fields of sugar cane, rice plantations, and large orange groves. Trees covered with flowers and fruit embellish the banks and encompass the houses and beautiful villas of the farmers and rich planters of the country.

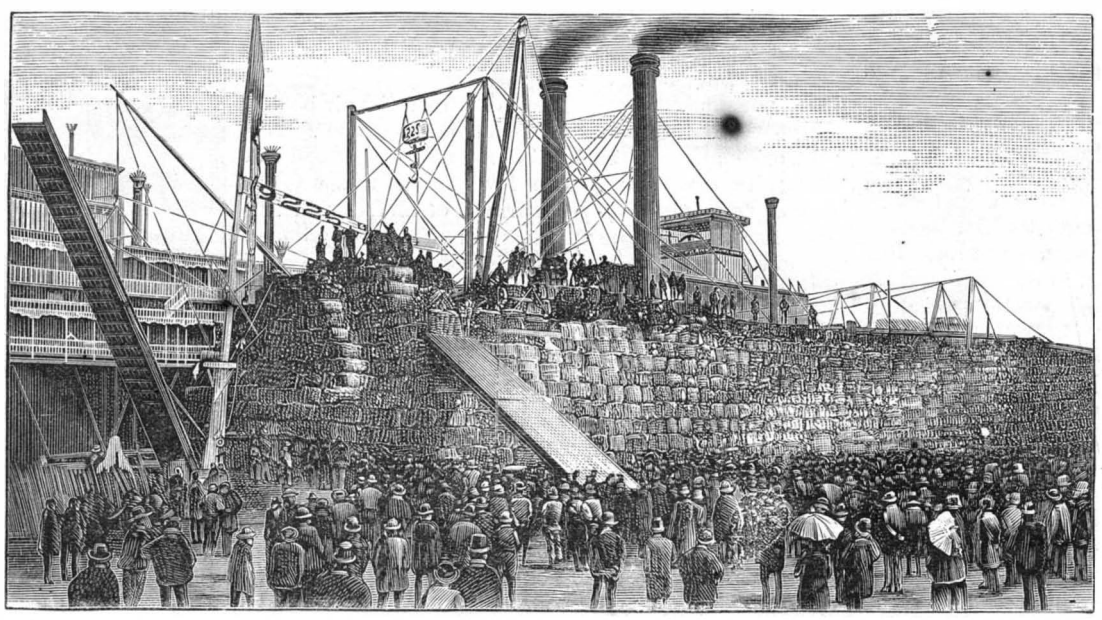
The orange trade is very extensive on the banks of the Mississippi near New Orleans. An orange tree does not begin to bear fruit in this region until it is six years old. When it reaches ten years of age, it is capable of yielding as many as 3,000 oranges per annum. A little later, the annual crop may reach 6,000. Some trees are cited that have yielded even 8,000 oranges; but such an occurrence is spoken of in the country as being exceptional. The maintenance of an orange tree requires but little labor, and the cost of it is covered by an average of 50 cents per annum paid to a laborer. It will be readily seen how large a profit is made on each tree by its owner, who sells his oranges at $3 per hundred.

Sunlit landscapes succeed one another, and form brilliant pictures of truly fairy aspect. Culture becomes rarer in measure as we approach the mouth of the river. A few farms are still to be seen, shaded by ancient trees that are covered with a gradually encroaching moss* that will finally kill them. This parasitic "moss" is collected in large quantities and dried by the inhabitants. It is used for the same purposes as the seaweeds that we collect on our coast.

A large number of ships were met with during this long trip. Among others, we saw a small steamer that was approaching us with great speed. It was the letter and dispatch boat, that does postal service for the country and villages along the river. It approaches the shore, and lowers from its deck a sort of drawbridge. Three men run down this and push barrels, packages, and other objects before them. It takes but a second for this maneuver, when the men are all aboard again, the bridge is raised, and the steamer is off, seeming to disappear as if by enchantment, in order to deposit letters and packages elsewhere. Finally, the river begins to contract, reeds cover the banks, as well as the sandy grounds, that are inhabited by birds that, frightened by the noise of our vessel, take to their wings. The delta of the Mississippi occupies an immense territory, consisting of marshy tracts that extend away out of sight. The outlet is very narrow, and is inclosed between jetties roughly built upon piles, with hurdles filled in with stone. The width of this outlet, which gives access to the Gulf of Mexico, is but 200 yards.



NEW ORLEANS COTTON PRESS.



A NEW ORLEANS COTTON WHARF.

Tillandsia usucoides, the long, black, or Spanish moss of the Southern States. Not a lichen (as stated by Mr. Tissandier), nor a moss, but a pendulous, parasitic flowering plant, with thread-shaped stems, belonging to the same botanical order with the pineapple.—ED.

Slow Combustion.

Spontaneous combustion is said to be an impossibility, but a phenomenon that at one time would be ascribed to that cause has lately been observed in the suburbs of Paris. In 1871 a fire occurred in a villa. The reparation was carried out under the direction of an architect, and the house has since been occupied by the same owner. One day he observed that the ceiling of the dining room appeared as if some of the plaster was about to give way, and, as the bulging increased, he called in an architect. He concluded that a beam must somehow have given way, and workmen were employed to make a more close examination. It was then discovered that the wood was almost entirely consumed. Some spark may have remained, and during fifteen years the destruction must have gone on by inches, for no other hypothesis was brought forward than one of very slow combustion. The circumstance is so remarkable as to appear almost incredible, altough firemen can relate stories of a similar kind.

A HUNDRED-ACRE peat bog has been discovered near Ellendale, Dak.

The Benefits of Machinery.

The other day the introduction of a machine for "basting" the hems of certain garments, into a factory in New England where clothing was made, was the cause of great complaint and almost of a strike; the reason being that one such machine would do the work of five or six women, who would thus be thrown out of work. This little incident, of itself insignificant, supplies a curious illustration of the tenacity with which ignorant people, in spite of the overwhelming evidence of experience, hold to the notion that machinery is the enemy of the laborer. The proof that mechanical invention has helped the laborer far more than it has helped any one else is of the most conclusive character. We cannot present the whole case here, but let us take two or three facts.

In ancient times a conquering invader of a country always concluded his victory by doing one thing: he swept off a large part of the population, took them home with him, and made them slaves. Why? Because he wanted to remove from his own people a part of the burden of toil. History is crammed with accounts of such performances. In fact, the process endured to our own time, for the capture of negroes in Africa, and their deportation to this country to be sold as slaves, was simply another form of the old business. The slave trade merely supplied a demand for labor from people who wished to reduce their own labors. Now, observe: The invention and general introduction of the steam engine ended this kind of thing forever, for it gave to man a servant far more tractable, more economical, more energetic, more tireless, than any number of human servants could possibly be. The first effect upon the laborer, of this change, was to uplift him and give him dignity. Labor is no longer joined with slavery.

This is the century of the steam engine. This same century has witnessed the emancipation of the slaves in this country and of the serfs in Russia. It will not close before the slaves will be freed in Cuba and Brazil. Then there will not be an involuntary bondsman in any civilized land on earth. That majestic fact, of vast importance to the toiling man everywhere, is due solely to the advancement of mechanical invention. And, meantime, the general status of the laborer has been so much advanced that he is now for the first time in the history of the world counted as a great political and social power. The laboring man to-day is on top. That is a practical, even if it be a startling, fact.

Note this, also: The laborer in civilized countries now earns more money than he ever before earned, and the things which he requires for his comfort and his pleasure cost less than at any former period since the creation. If workingmen would only read history, they would find much to induce them to greater contentment. There was not in the British Islands, three hundred years ago, a dwelling house that would compare in comfort with any one of the tens of thousands of excellent homes owned in this country to-day by men who earn ten or twelve dollars a week. Such a man has articles of furniture, clothing, books, newspapers, musical instruments, opportunities of cheap conveyance, chances for free education, and hundreds of other blessings which nobody had two centuries ago, which the richest could hardly procure one century ago, and all of which have tended to make laborers more comfortable, happier and healthier, and within easier reach even of wealth. The whole of these advantages have been supplied by machinery. The poor man has them because machines have been invented to do the work which men used to do, and because these machines have capacity for production far beyond the unaided capacity of man.

The truth is that the displacement of human labor by machinery has always been followed by an increased demand for such labor at better wages and a decrease of the prices of the articles for which wages are expended. In the entire range of mechanical invention we cannot now recall a single exception to this rule. In view of such facts, there is something almost pitiable in the persistence with which working people continue to manifest antagonism to the introduction of labor saving devices. Such hostility, wherever and whenever it is manifested, involves a confession of unpardonable ignorance and stupidity.—*Textile Record.*

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EXPERIMENTS IN PNEUMATICS WITH A STEAM VACUUM.

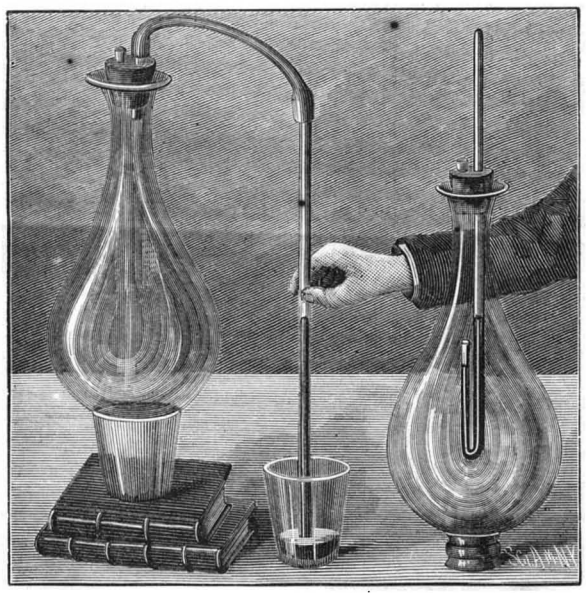
T. O'CONOR SLOANE, PH.D.

Some weeks ago, a description was given in the present series of articles of how a steam vacuum could be produced.* The experiment as detailed there was performed with Italian wine flasks, and is one that possesses a certain historical interest in connection with the early inventors of the steam engine. By developing this experiment a little, producing steam and condensing it, very interesting work may be done with steam vacua, many of the air pump experiments being thus simply reproducible. For the receiver or bell glass of the air pump, a round bottomed flask is substituted; the elastic force of steam represents the piston of the air pump as it lifts the atmosphere and expels it from the flask. Finally, the muscular force of the experimenter with the ordinary air pump is represented in the lamp by which the water is brought to boiling. The flask must be one in which water can be boiled without fear. Every piece of glassware will not stand this, and it is annoying to have to adopt special precautions in applying the heat. It must be strong and round bottomed, otherwise it will not stand the atmospheric pressure. Its neck should be as wide as possible. It should be provided with a doubly perforated India rubber cork. A few pieces of glass tubing, some closed at the end to answer for plugs, others open, some rubber tubing, and an alcohol lamp, complete in general the necessary apparatus.

To produce a vacuum, a little water, one or two wineglasses full, is poured into the flask, and brought to a rapid boil. This can be done by holding the flask with its bottom in the flame of the lamp. After two or three minutes' strong boiling, the cork, with both apertures plugged, is put in the neck, being held a little to one side. Eventually, it is pushed down, the flask at the same instant being removed from the lamp. On cooling, an almost perfect vacuum is produced. The cooling may be accelerated by blowing against the sides or by pouring cold water over them, when the water within the flask immediately begins to boil; and if cold water is used, the action is still stronger. This represents a well known paradox—a fluid boiling by cold; the effervescence being caused by the reduction of pressure due to the condensation of steam.

To refill the flask with air, one of the glass plugs must be withdrawn from the cork, when the noise of the entering air will be heard. Thus the flask and attachments represent an air pump.

The experiments illustrated in this issue are designed to show the pressure of the atmosphere. For the first one, an India rubber balloon is required. These can be bought in toy stores, where they are sold attached to little pipes, forming a miniature bagpipe. One aperture in the cork is closed with a plug; through the other an open-ended tube is pushed; and over the end that is to go into the flask, the neck of the balloon is passed. It may, to secure it, be wound with a few turns of thread. This will not be necessary if the tube is of proper size. A little water is poured into the flask, and brought to active ebullition as before. Then the flask is taken from the flame, while the cork is introduced with the precautions just given. The steam begins to condense, and in an instant the balloon, under the effect of the atmospheric pressure, expands, and almost completely fills the vessel. The sudden swelling up of the balloon is quite impressive. Another way to conduct the work is to use the cork with its second aperture unplugged, to introduce it firmly while the flask is yet cold, and then boil the water. After condensed steam has appeared for some minutes escaping from the aperture, the latter is plugged as the flask is taken away from the lamp. After the balloon has expanded, it sometimes is so thin that it is semi-transparent.



BAROMETER AND MERCURY COLUMN.

This method of working with a plug, first securing the cork, is the better way in general, though it is not always convenient.

To show the pressure of the air, the barometer may be used. A tube twenty to thirty inches long is closed at one end, and bent into a siphon barometer.

EXPERIMENT WITH BALLOON.

This is filled with mercury, and passed tightly through one of the openings in the cork. The barometer may be easily made by any one accustomed to bending glass tubes. If it proves troublesome to fill a bended tube, enough mercury for the experiment may be poured into the straight tube, and then the bending may be done. A column of mercury fifteen inches high is sufficient.

While the flask is yet cold, the unplugged cork is tightly placed in the neck, with the barometer projecting as shown in the cut. The water is boiled, the cork plugged, all as before, and the flask allowed to cool.

As the vacuum becomes stronger, the mercury begins to fall in the outer sealed arm and to rise in the inner. Any excess that escapes falls into the water in the bottom of the flask. Eventually, the level of the mercury in both limbs becomes nearly the same. The apparatus may be laid aside for some hours, to see how long it will retain a vacuum. The mercury should remain as left for a long time. To open the flask, the plug is first removed.

This demonstration of the pressure of the air begins where the other ends, and is an indirect proof. The tube originally remained full of mercury because of the atmospheric pressure. The level fell as this was removed from the exposed surface of mercury in the open limb. A simple modification of this experiment is shown, where an open tube is used whose end dips into mercury contained in a vessel by the side of the flask. The vacuum draws mercury up into the tube.

The pressure of the air may be made to drive water into the flask. A piece of tubing is drawn down to a fine aperture, and passed through the cork with the small end downward, so as to come within the flask. The other end of the tube is bent at right angles, or has a short piece of India rubber tubing slipped over it. The cork is plugged and placed tightly in the flask, previously supplied with water. The water is boiled well until steam has issued from the tube for a minute or so. Care must be taken not to generate steam pressure enough to expel the cork. The flask is removed from the lamp, and the open end of the tube is immersed in cold water as quickly as possible, the flask being supported in a horizontal position. For a moment nothing is seen, but the cold water condensing the steam soon rises, and is driven into the flask, forming a horizontal and perfectly steady thread of fluid. This may be made a vertical fountain by holding the flask upright. As the water entering fills the flask the jet becomes submerged, and the entering water carries other water with it, producing a curious effect. A most interesting feature is the apparent immobility of the jet. It resembles a bright rod of glass reaching across the flask. This is a variation on the fountain *in vacuo* experiment.

From these experiments the fact will be deduced that steam is invisible, as in each one the flask is filled with steam, though nothing can be seen. Other air pump experiments that can thus be executed will be described later.

* See SCIENTIFIC AMERICAN of July 3, 1886.

Transparent Paper.

How to render paper transparent, especially paper photo negatives, is thus described by Mr. W. E. Woodbury. Using castor oil answers as well as any other method, the best recipe being the following: Take of castor oil 5 parts, and of ether 1 part; place the negative, face downward, upon a sheet of glass, and spread the solution thickly over it; well warm it till the oil has thoroughly soaked into the paper, and when cool remove the superfluous oil, and again warm; should any of the oil get on the surface, it can be immediately removed with a little ether.

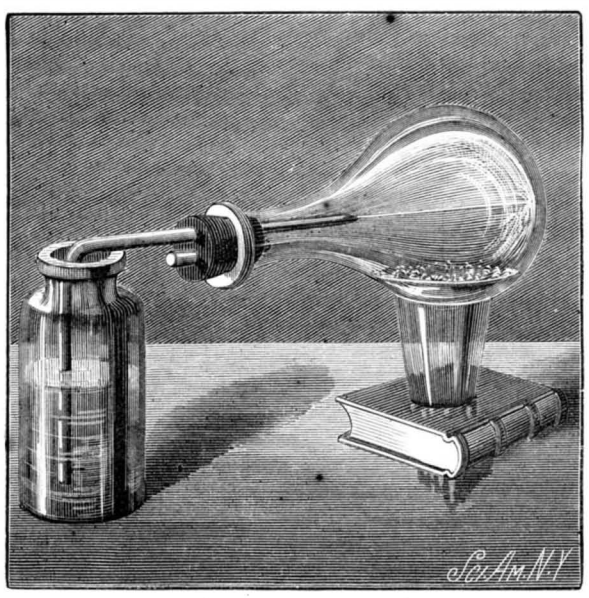
Another method adopted is by using Thomas' India rubber solution, 2 parts, dissolved with 2 parts Canada balsam in 3 parts pure benzole, and rubbing well into the back of the negative with a piece of cotton wool till thoroughly soaked and dry.

Passing through melted paraffine wax is also an excellent method. This must be effected at such a temperature as to enable it to thoroughly penetrate the paper. Better *not* to iron, as so often recommended, but simply to warm, and with a piece of soft cloth take off the superfluous wax. Paraffine cools instantaneously, and does not soil the albumenized paper; it renders the paper perfectly free from granularity, and prints very rapidly.

A process by no means easy, but which we have ourselves carried out with great success, is the following: gum dammar 20 parts, and gum elemi 5 parts, dissolved in 100 parts of benzole. Pour into a flat dish, and place the negatives in one after another, and allow them to remain for about five minutes; at the expiration of that period remove, and hang them up to dry. Benzole must be constantly added to the solution, in consequence of its speedy evaporation. The negatives will be found to be wonderfully transparent, and, of course, require no varnishing. If vaseline is employed, the negatives must be kept constantly between oiled sheets.

The Cunard Steamer Etruria.

The Etruria, plying between New York and Liverpool, commenced her career rather more than a year ago, having made her trial trip in March, 1885. She was built at the Fairfield yard, and is 520 ft. long, 57 ft. 3 in. broad, and 41 ft. deep. The displacement is 9,860 tons. She ran during a six hours' trial on the Clyde at the rate of 20·233 knots (about 23 miles) an hour, the revolutions being 67·5 per minute. The Etruria is arranged to accommodate 720 first-class passengers, and the saloon will seat 280 people. The engines are of the type usually fitted at Fairfield into large passenger vessels, having a high pressure cylinder in the center and two low pressure cylinders, one on each side. The former is 71 in., and the two latter 105 in. each in diameter. The stroke is 72 in. The boilers are nine in number, and the steam pressure is 110 lb. The heating surface is 38,817 square feet, and the bar surface 1,606 square feet. The engines are said to have given off "something close upon" 15,000 indicated horse power on one occasion. The consumption of coal is stated to be 315 tons a day. The moulded draught is 22 ft. 6 in., and the area of midship section 1,090 square feet. This ship has made the quickest run across the Atlantic, viz., 6 days 5 hours and 31 minutes. The Etruria is lighted throughout, even down to her shaft tunnel, by electricity.



FOUNTAIN IN VACUO.

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THE HAMBURG ELECTRIC TRAMWAY.

In May last, the entire local press of Hamburg was invited to be present at some experiments on electric traction. It is a question here of a city tramway line, organized under the direction and auspices of Engineer J. L. Huber, who has secured the working of the patents taken out in Germany by the Messrs. Faure, of the Electrical Power Storage Company, of London, and by Julien, of Brussels.

Your readers know the excellent results that the above named company has reached with its style of accumulators.

Mr. Julien, through the introduction of an important improvement into the construction of these apparatus, has singularly increased their practical value. The lead that forms the positive plates is slowly destroyed in consequence of the chemical phenomenon that Mr. Plante has called the *formation* of the secondary pile. When this formation, which is really an oxidation of the metal, is allowed to go on for a certain length of time, the plates are soon observed to get out of shape, or even become destroyed and fall into fragments. Mr. Julien has succeeded in limiting this destructive action of the oxygen by substituting for the lead of the accumulators an alloy that is not attacked. I do not know the exact composition of this alloy, but it must give good results, since Mr. Huber uses it exclusively in the construction of his accumulators. The secondary elements are inclosed in boxes made of a new material, which, in certain respects, differs from ebonite. As regards insulation and lightness, it is but slightly distinguishable from ebonite, but it has a certain flexibility and a greater resistance to breakage—qualities that render the use of it particularly advantageous in the composition of an apparatus for rolling stock, as is here the case.

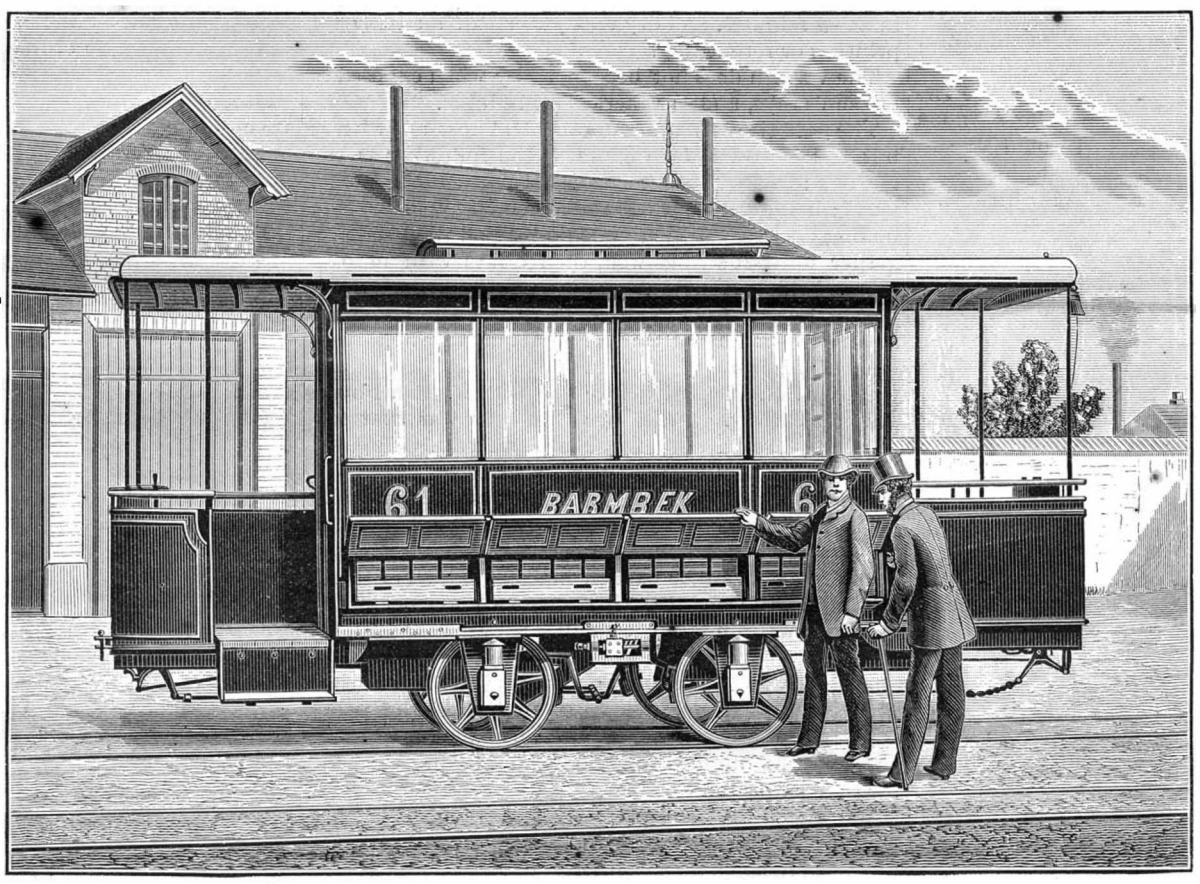

Fig. 1.—ELECTRIC TRAMWAY CAR AT HAMBURG

I illustrate these notes with a few photographic views. The car is built for the carriage of 33 passengers, and weighs, loaded, 10,625 pounds. The weight of the accumulators alone is 2,640 pounds. The battery of accumulators consists of 96 elements, each of which is formed of 15 plates—17 positive and 8 negative. The surface of the plates is relatively small (5 × 6 in.), and their thickness is 0·15 in.

The elements are grouped at first by threes, and then by twelves, in partitioned boxes. These latter are arranged along the sides of the car in a space prepared for their reception, as shown in Fig. 1. Owing to this arrangement, and to the accompanying accessory ones, manipulation is rendered very easy.

The replacing of the exhausted accumulators is very easily effected. Fig. 2 will help to make understood the processes employed by Mr. Huber. This figure represents the car in the depot, standing between two long platforms that are used for putting in and taking out the accumulators. The boxes containing the elements move along well greased slides, so that it takes but the least effort to move them from the car to the platform, and *vice versa*. When the accumulators of a car are exhausted, the latter is hauled into the depot and brought to the position shown in the cut, and the boxes are removed. After this has been done, the car is shoved ahead so as to bring the empty spaces opposite a series of charged boxes, which latter are then pushed into the compartments in front of them. The car is then ready to start.

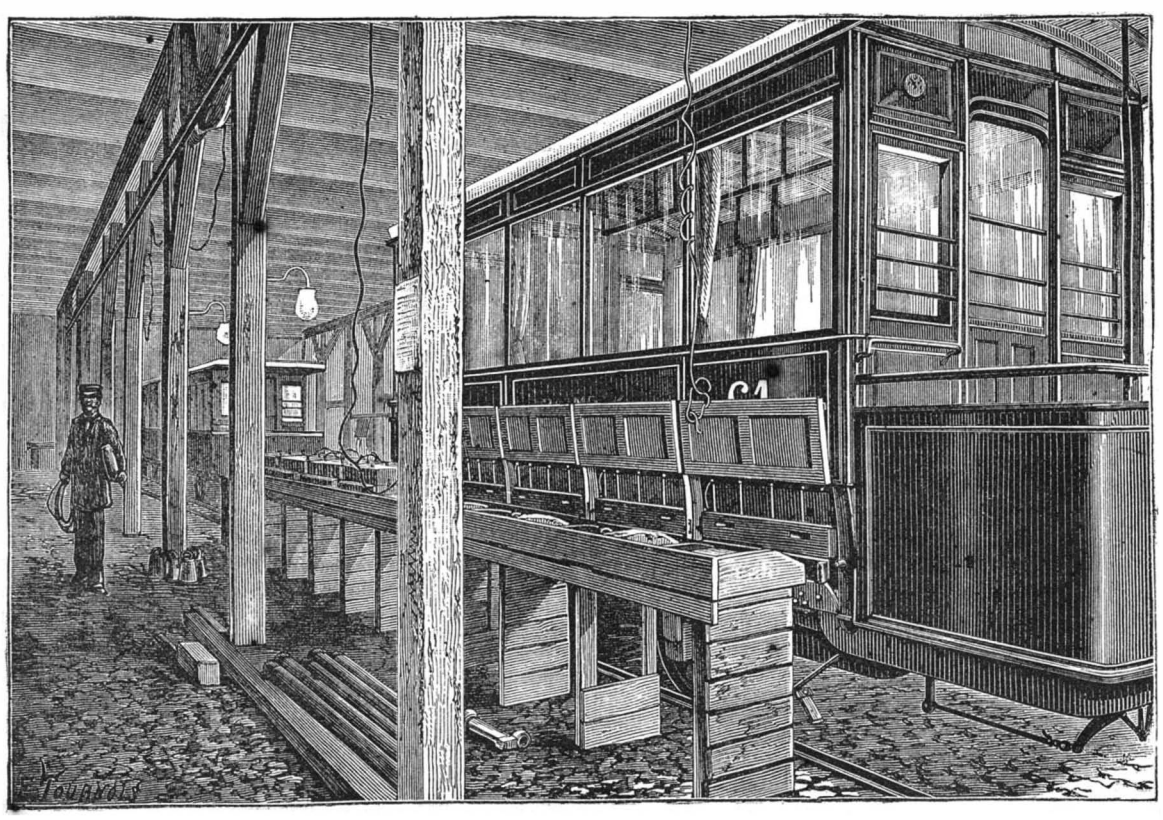

Fig. 2.—INTERIOR OF DEPOT.

Thanks to a very simple and ingenious device invented by Mr. Huber, the communications of the accumulators with the charging circuit when they are on the platform, as well as with the speed regulator when they are on the car, are effected automatically by the maneuvers of transshipment solely. On each side of the boxes that contain the secondary piles there are arranged strong contact screws, to which correspond contacts fixed upon the platforms as well as in the drawers of the car. The manipulations are thus greatly simplified, and may be intrusted to the ordinary employes of the stable.

The space occupied by the generators is of very modest dimensions. The steam engine is of the Lilienthal type—a small vertical one of ten horse power, mounted upon a bracket; and steam is furnished to it by a generator, about which there is nothing peculiar. A Buss tachymeter permits of regulating the velocity of the main shaft at any instant. The two dynamos are of the Schwerd type, and each is capable of running a car. This arrangement is rendered complete by an assortment of voltameters and amperemeters of various styles (Patterson & Cooper's, Breguet's, Hummel's, and Ayrton & Perry's), which permit of watching the electric state of the elements.

The electric motor that actuates the car is a Siemens dynamo, D_2, in which the inductors and armature are grouped in series. The total resistance is 0·6 ohm. The change in the motor's direction of running is secured by the use of two pairs of brushes, one to cause the car to run forward and the other to run it backward. The dynamo is connected by a cord with a shaft suspended in the center of the car, between the axles. The motion of this shaft is transmitted to the axles through the intermedium of pitch chains.

I must give a few details regarding a very ingenious device invented by Mr. Julien for regulating the speed of the motor without having recourse to the use of artificial resistances. Upon each of the platforms there is a commutator, against which rubs a contact lever. The accumulators are distributed in three groups, and the elements of each of these are connected in series. The terminals of these four groups communicate with regulating commutators, by means of which one can, according to the lever's position, bring about one of the six following combinations:

1. No connection with the accumulators. It is only in this position that the maneuvering key can be put in place.
2. The four groups mounted in quantity.
3. The groups in tension, and then quantity.
4. Two groups in quantity, and then in tension with two others.
5. The four groups in tension.
6. All the groups in quantity. Connection with the motor broken—the position of rest. When the winch has this position, it cannot be made to turn back.

It is easy to see that positions 2, 3, 4, and 5 give four different tensions, of 48, 96, 144, and 192 volts, to which correspond the variable speeds of the motor. This arrangement is a very happy one as regards economy, since all the energy of the accumulators is effectively expended.

The car is capable of making a 30 mile trip with a single charge, and the time required to recharge the accumulators is eight hours. The car that is now in service between Rathhausmarkt Place and Bambek runs 60 miles a day. It therefore necessitates two charges daily.

The intensity of the current on an ordinary run, that is to say, on a level and straight line, is 10 amperes. But on going around curves and up steep gradients, the intensity may, exceptionally, reach 80 amperes.

After visiting the plant just briefly described, Mr. Huber invited us to take a seat in the car. The automaton appeared to be very familiar with its electric horses, and everything ran as well as could be desired.

Upon the whole, the plant, although modest, is an entire success. It is an encouragement and a promise for the future of electric traction.—*F. Uppenborn, in La Lumiere Electrique.*

Resuscitation of the Drowned.

One of the simplest methods of artificial respiration is that which Mr. J. A. Francis has described in the *British Medical Journal*. The body of the patient is laid on the back, with clothes loosened, and the mouth and nose wiped; two bystanders pass their right hands under the body at the level of the waist, and grasp each other's hand, then raise the body until the tips of the fingers and toes of the subject alone touch the ground; count fifteen rapidly; then lower the body flat to the ground, and press the elbows to the side hard; count fifteen again; then raise the body again for the same length of time; and so on, alternately raising and lowering. The head, arms, and legs are to be allowed to dangle down freely when the body is raised.

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Correspondence.

A Standard Measure.

To the Editor of the Scientific American:

I read in old times that kings and other rulers had great trouble in finding a permanent measure for the yard or foot. Some used their own foot, others a stick, others a certain millionth number of the meridian. I suggest the following idea for a permanent measure for the inch: Take a plain mirror, on the equator, at noon, on any certain day, and get the size of the sun's disk, which will be about an inch. This will be the same size on any meridian around the globe at noon on the same day, and unchangeable. I would like to hear from some of your many intelligent readers on this subject. F. M. SHIELDS.

Coopwood, Miss., Sept. 12, 1886.

"Saltpetering" in Stone.

The actions capable of affecting the stability of the composition of ordinary building stones, by reason of the new forms of matter they superinduce, may principally be considered to be those resulting from the absorption of the gases of the atmosphere, and especially the extraordinary process known by the name of "saltpetering," or, more correctly speaking, of nitrification. This process displays itself in the formation of minute crystals, effloresceing from the interior to the exterior of the stone, and it leads to the destruction of the exposed surfaces of the latter, through the gradual removal of the minute particles, in consequence of the disintegration produced by an expansive action of the crystals in process of formation.

It is supposed that the organic matter diffused through nearly all stratified deposits gives rise to the formation of certain nitrates (such as the nitrate of lime or the nitrate of soda) under the influence of damp and of air, and of light of certain descriptions—for nitrification certainly takes place most abundantly near damp ground, rising in a wall *pari passu* with the range of the capillary attractions of its materials, and upon the northern or shaded faces of the said walls. Not only does this nitrification throw off the minuter and less adherent particles of the building materials themselves, whether they be stone or brick, but it is also able to detach any protecting coat which may be put upon them, if the adhesion of that coat to the subjacent material should not be of a very energetic nature.

Let the adhesion, however, be ever so energetic, if once the action of nitrification should have been established it must run its course, and the amount of evil it is capable of producing will simply depend upon the quantity of organic matter originally contained in the materials or susceptible of being absorbed by them from the atmosphere. The secondary limestones which have not been affected by plutonic action, the loamy clays, some kinds of pit sand, sea sand, and some descriptions of natural cements, are particularly exposed to the danger of nitrification in damp positions; and whenever it is once established, it is in vain to expect to be able to preserve any mural paintings, or even any sculpture of a delicate character. It is also to be remarked that nitrification will frequently take place in the most dangerous manner precisely in those materials whose exposed surfaces are covered with coatings impervious to the air; and that in houses or buildings of that character it is most energetic on the interior faces of the walls, or precisely on those which are the least exposed to the atmosphere. In fact, it is mainly in consequence of the absorption of moisture by the building materials, and of the chemical changes thus produced in the organic matter those materials may contain, that the peculiar form of decay which accompanies "saltpetering" arises.—*G. R. Burnell.*

Dr. Abernethy's Prescription for a Dyspeptic.

General John A. Dix was at one time the unhappy victim of dyspepsia. After seeking in vain for relief, he was at length led to consult the famous Dr. Abernethy. After listening impatiently to his story, Abernethy interrupted him with these words:

"Sir, you are pretty far gone, and the wonder is that you are not gone entirely. If you had consulted common sense instead of the medical faculty, you would probably have been well years ago. I can say nothing to you excepting this: You must take regular exercise, as much as you can bear without fatigue, as little medicine as possible, of the simplest kind, and this only when absolutely necessary, and a modest quantity of plain food, of the quality which you find by experience best to agree with you. No man, not even a physician, can prescribe diet for another. A stomach is a stomach,' and it is impossible for any one to reason with safety from his own to that of any other person. There are a few general rules which any man of common sense may learn in a week, such as this: That rich food, high seasoning, etc., are injurious. I can say no more to you, sir; you must go and cure yourself."

It is needless to say that General Dix was rewarded by restored health and a good old age.

PHOTOGRAPHIC NOTES.

Varnish for Gelatine Plates.—Mr. W. M. Ashman, in the *Photo. News*, recommends the following as a good, rapidly drying varnish for gelatine negatives, which does not require the application of artificial heat. The mixture consists of ordinary gold oil size, such as can be purchased for adhering gold leaf to glass, and pure benzole, free from grease, in equal volumes. Gelatine negatives coated with this mixture become surface dry in a few minutes, and dry enough in half an hour for printing or retouching.

The varnish does not become tacky when exposed to the sun's rays, and is practically insoluble.

The gold size is readily obtained almost anywhere; but if it is desired to make it, the following is the formula: Picked amber or copal, 1 part; linseed oil, 2 parts; boil until it strings well, then add to 6 parts of boiling and very drying boiled oil. Boil the whole together until it strings well, then dilute with 10 to 12 parts of old turpentine.

Hints on Making Paper Negatives.—We find reported in the *Photo. News* a concise summary of the advantages of paper over glass in making negatives, as stated by Mr. J. H. Pickard before the Birmingham Photographic Society. The paper employed was that furnished by the Eastman Dry Plate and Film Company. He says:

I will just point out the different advantages the film negatives possess over glass negatives.

Portability, both in storage and weight; 250 paper negatives can be packed in a single inch of thickness, and will weigh less than twelve glass negatives. I may mention how much handier they are for postage, etc. They never break.

Breakage in Printing.—Sometimes you break a glass negative by extreme pressure. In the case of paper negatives, this can never occur; any amount of pressure may be obtained. Here is an unfailing remedy for blurred prints.

Halation.—You are perfectly free from this, as the only reflecting surface is in direct contact with the film (viz., the paper). The interior of churches, etc., may be taken with the lens pointing to the east window, getting every line and pane perfect, no matter how long the exposure may be. I have taken landscape with the trees, etc., against a bright sky, and the sharpness has been remarkable.

Speed.—I consider this to be much faster than the glass, and quite equal to instantaneous work, and can assure you that if we could only get the same emulsion on glass as Eastman gives us on the paper, we should obtain the *par excellence* of pictures.

Dust Spots.—These you do not get, if you only wind on another piece just before you expose; and of course, after you have taken the picture, whatever dust accumulates does not matter, as a careful developer always looks to this.

Easy Development.—The company give a formula for potash and soda, but I always use my favorite developer, Beach's. The paper is simply soaked in water till limp, the developer poured on, and the image, with a properly exposed picture, appears in from ten to twelve seconds. The method of development I will demonstrate to you further on. In some cases slow, weak development gives the finest results. Time can be saved by developing two or three at the same time, but I do not recommend this for amateurs.

Fixing.—This is done with a similar hypo solution as used for glass:

Hypo	4 ounces.
Water	1 pint.

But care must be taken by looking through the negatives to notice any unfixed portions, which will look dull against those fixed, which are clear. When fixing I wash them for about a minute or two under the tap, and then place them in a bath of alum, hydrochloric acid, and water.

Saturated solution of alum water	2 ounces.
Hydrochloric acid	1 ounce.

This bath, in a few seconds, clears, or rather bleaches, the whites, and renders the picture very apparent and distinct. Wash in four or five changes of water, or, better still, as I have done lately, put them face downward in a tub of water, and change the water in about an hour's time. This way was mentioned in my hearing by Mr. A. L. Henderson at the Derby Convention.

Drying.—Lay them down, while wet from water bath, on a sheet of ebonite, put a sheet of blotting paper over, and squeegee down (some recommend glass rubbed with French chalk, but with this they have a nasty habit of sticking and spoiling a negative). When dry, which will take six or eight hours, you can easily peel them off with thumb and finger.

Retouching and Spotting.—In this you save time, as no grinding or varnishing is required, and it is much simpler than on glass; it can be retouched on both sides. I have done but little myself, but friends who do retouch say how much pleasanter the surface is to work on than the glass.

Printing.—To print quickly, so they say, you must oil them. My advice is, don't do anything of the sort. sort. Oil vaseline is recommended by Eastman. I tried it at the beginning of my experience, and not only spoilt my negatives, but many other things besides, and all those I did get transparent have since become mealy, and wanted doing again before I could print from them, although I kept them in oil paper envelopes. So take my advice, and use them unoiled, as I do. The packing and keeping is then cleanly, and a large number can be kept in an empty half plate box. The shortness of time in printing is marvelous, very nearly as quick as the glass. You can print them in direct sunlight, as the paper itself is a light-diffusing medium, and on an ordinarily light day about half an hour is an average time.

Bromide Printing.—The paper negatives, to my idea, are certainly the best negatives for this class of work, some two or three seconds being quite ample time to expose to produce an effective picture; with lamplight, of course, a longer exposure is needful.

Enlargement.—Personally, I have had little or no practice in enlarging, but will quote the authority of a well-known amateur, Mr. A. Dresser: "I enlarged from both oiled and unoiled prints. In enlarging half-plate to 12 by 10, with portrait lens, small stop, two minutes for oiled prints, and four for unoiled, is an average time."

Frilling is unknown, since the gelatine seems to keep tight to the paper, notwithstanding its pliability.

Changing is readily done in any dark place, and not unfrequently I have changed by daylight, only spoiling two thicknesses of the paper; here is a great advantage when traveling.

Having now seen the manipulations of the processes required in paper negatives, and trusting I have been able to make them as simple to you as they are to me, I feel sure that any one who takes up the paper negative, with its body guard and servant, the roller slide, will never regret the change, and will be charmed as much as I am with the simplicity, comfort, lightness, and general ease with which amateur photographic picture making is accomplished with the Eastman roller slide.

DECISION RELATING TO PATENTS.

U. S. Circuit Court.—Eastern District of Wisconsin.

CALKINS *et al. v.* OSHKOSH CARRIAGE CO. *et al.*

Dyer, J.

Letters patent No. 261,829, of August 1, 1882, to Alton J. Calkins, for an improvement in carriage bodies, are void for want of novelty.

The patent was for a carriage body having rounded corner posts, with grooves to receive the side and end panels, and tenons to receive side and end rails, and corner irons to hold the rails rigidly to the posts, the whole forming a carriage body ingeniously adjusted and held together without the aid of screws, but all the elements of the claim were old, and in view of the prior state of the art, *held* that it did not require invention to bring them together.

Although the adjustment of the different parts of patentee's combination was novel, and the combination, as an entirety, useful, *held* that it exhibited only the expected skill of the mechanic's calling, and not the creative work of the inventor.

TRADE MARK DECISION.

U. S. Circuit Court.—Northern District of Illinois.

LORILLARD *et al. v.* PRIDE.

TIN TAG TOBACCO.

Blodgett, J.

Tin being one of the common metals in use by the bublic for a very large variety of purposes, and being easily stamped or impressed with letters, figures, or characters, or cut into various shapes, and taking readily different colors or shades besides its natural metallic luster, and, like paper, becoming readily the vehicle or material for receiving whatever impression or color may be stamped upon it, *held* that the attempt of complainants to appropriate tin to their exclusive use in marking plug tobacco without regard to its color, shape, or the character or letters it bears, is not within the scope and purpose of the law of trade marks.

Complainants having attempted to secure to themselves by means of a patent the exclusive use of tin as a badge for their plug tobacco, and their goods having acquired the name of "Tin Tag" goods while they were acting under their patent, *held* that when the patent was declared void the right to so indicate or mark such goods became public, and complainants cannot perpetuate or continue this right by claiming it as a trade mark.

The use of arbitrary terms—such as "Tin Tag" or "Wood Tag"—by a manufacturer to indicate goods produced or sold by him might be allowed if the person so using the name or words branded them upon his goods, or in any way gave the goods the name; but that would give no right to the exclusive use of the tin or wood as a material to designate the goods.

SOME one has discovered that a weak galvanic current, which will sometimes cure a toothache, may be generated by placing a silver coin on one side of the gum and a piece of zinc on the other. Rinsing the mouth with acidulated water will increase the effect.

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A TROPICAL STAG BEETLE.

There is scarcely any one who does not know that large Coleopter called the stag beetle. The head of the male of this insect is provided with large mandibles that recall the antlers of a stag, and which oblige it to fly with its body nearly vertical, when it makes its appearance on warm June evenings among the oaks, whose trunks afford food for its larva. The use of these large appendages, which are wanting in the female, is unknown. By the Romans, they were suspended from the necks of their children, in order to preserve the latter from the diseases incident to youth. In certain parts of Germany, the belief obtains that these insects seize glowing coals with their pincers and go about spreading fire. In reality, despite this formidable appearance, stag beetles are perfectly harmless, and, with their tufted jaws, take delight in sucking the liquids that ooze out from the crevices in oaks. Swammerdam had one which he fed with honey, and which it is said followed him about like a dog.

We find the same exaggeration of mandibles diverted from their normal masticatory function, but in the adults and larvæ of some Central American Coleoptera belonging to quite a different type. Some species belonging to the family Prionidæ, of the order Coleoptera, with long antennæ and four articulations in the tarsi, have been known for a long time, and for these, by reason of their very large mandibles, Audinet Serville established the genus *Macrodontia*—a word meaning "long tooth." In these the mandibles are straight, larger than the head, toothed on the inside and curved at the extremity, yet of variable form. The head is as long as wide, plano-bicarinate beneath, and broadly hollowed out in front. The antennæ, as in all the Prionidæ, are short for a Longicorn, and, when bent back, scarcely reach the middle of the elytra. The first articulation is like a triquetrous club, the next ones are filiform, and, starting from the third, are provided with very close, reticulated pores. The eyes are very large and prominent, and strongly convex above, thus showing the insects to be crepuscular. The thorax is transverse, with six projecting spines, three on each side, the four anterior subequal, and the posterior shorter. This laterally tri-spinous thorax is an essential character of the Prionidæ. The scutellum is heart-shaped, and sharp behind. The elytra are very ample, either middlingly convex and subparallel, or oblong-oval, rounded or truncate at the end, with their sutural angle briefly spiny, and are a little wider than the prothorax at their base. The feet are long, with short and very wide tarsi, which gradually enlarge, articulations 1 and 2 being subequal. The last abdominal segment is rounded behind, with a narrow indentation in the middle.

The body is broad, depressed, glabrous, and winged. The antennæ of the female are like those of the male, the mandibles are also similar, but shorter, and the last abdominal segment is broadly truncated behind. The typical species of the genus *Macrodontia*, and the one that we find quite frequently in the cases of dealers in insects, is the old *Prionus cervicornis*, L. (Fig. 1), of Cayenne, Colombia, and Brazil. The mandibles, head, and prothorax are of a reddish brown, with a few vague, lighter blotches upon the prothorax. The antennæ and feet are of a reddish brown. The elytra are of a dark ocherous color, with longitudinal black or very dark brown blotches. A Cayenne male in the Museum collection is, inclusive of the mandibles, five and a half inches long. The genus includes six species at present, all belonging to tropical South America. After the manner of our European Prionidæ and Capricornia, the larvæ and nymphs of *Macrodontia* pass their existence in the interior of tree trunks, where the larvæ feed upon the ligneous tissue. They remain of a yellowish white, and are very thick set. The larvæ are either without feet or have but vestiges thereof, and have no strength except in their [illegible] and powerful mandibles, which serve for gnawing the hardest kinds of wood.

In Fig. 1 we represent, from nature, the nymph of *Macrodontia cervicornis*. In the development of the large antennæ of the adult from the small recurved ones of the nymph, considerable organic work has to be accomplished. In the nymphal state, the legs are

Fig. 2.—NYMPH OF MACRODONTIA. (½ Nat. Size.)

Fig. 3.—LARVA OF ACANTHOPHORA. (½ Nat. Size.)

folded beneath the breast, and the wing and elytra cases are pressed close to the sides.

We were not able to procure any larvæ of *Macrodontia* for our skillful artist, as these remain deeply concealed in the tree trunk. We figure a larva of very similar aspect of an allied genus, that of *Acanthophora serraticornis* (Fig. 3). The adults of these large Coleoptera, which fly in the evening, are captured by the natives on account of their singular form and the brilliancy of their colors. They are brought to the cities and sold to European merchant naturalists. The larvæ of the large Prionidæ are in demand on another account. Aside from their majestic proportions, they have a very appetizing appearance, their soft and transparent skin revealing the presence underneath of delicate tissues that put one in mind, through their yellowish white color, of the exterior of a well-fed fowl. Seeing that these larvæ do not live exposed to view, and are never very abundant, such qualities ought to cause them to be considered as an excellent prize by the Indians who chance to meet with them. In Jamaica and the Mauritius Islands, the Europeans, as well as the aborigines, eat the larvæ of Prionidæ known by the names of *moutac* and *macanco*. It is very probable that the larvæ of the large Capricorn that live in the interior of oaks, where they pierce galleries that injure the tree, were the worms called *cossus* by the Romans. These were said to be filled with a delicate cream, and figured with honor upon the table of Lucullus. The best worms to eat, says Pliny, are the large ones of the oak. Ladies used this substantial food in order to obtain a plumpness that prolonged their beauty.—*La Nature.*

Fig. 1.—A TROPICAL STAG BEETLE. (*Macrodontia cervicornis.* Natural Size.)

Bacteria in the Air.

At the commencement of June, 1884, Dr. Miquel, of Paris, who was then in London, made some observations on the number of bacteria contained in the air of Ryder Street, St. James'. A cubic meter of this air was found to contain only 240 organisms, but this low result was probably due to the wet weather which prevailed on four out of the five days on which the experiments were conducted—the air being remarkably free from dust. In Paris at the same time the air of the Rue de Rivoli contained 360 organisms per cubic meter. Dr. Miquel would not, however, be surprised to find that the air of London was habitually fairly pure and free from organisms, owing to the proximity of the sea and the fact that the houses of London being generally of no great height—unlike Paris—the streets are continually being swept by currents of air. The air of sleeping apartments is very impure as regards the number of contained micro-organisms. One such room in Paris was found to contain on the average, in the winter and spring of 1882, 73,540 bacteria per cubic meter, and the air of the Hopital de la Pitie has been observed to contain 79,000 bacteria per cubic meter. In contradistinction to these large numbers, the air over the Atlantic Ocean (Moreau and Miquel) has been found to contain from 0 to 6 bacteria per cubic meter, and the air of the higher mountains an average of only 1 bacterium per cubic meter (Freudenreich).

M. Moreau has investigated the number of organisms present in sea air. These investigations — undertaken under circumstances of considerable difficulty on board ship, and conducted on an elaborate scale—are of much interest as bearing on the treatment of phthisis by high mountain altitudes or by sea voyages, in both cases the special object desired being to place the patient in an atmosphere free from all impurities. We will quote a few of M. Moreau's conclusions on this subject: 1. Air taken on the coast, when the wind is blowing off the sea from a direction in which land is at a great distance, is in a state of almost perfect purity. 2. In the neighborhood of continents, winds blowing from the land always bring an impure atmosphere; at 100 kilometers from the coast this impurity has disappeared. 3. During moderate weather the sea does not yield to the air any of its contained bacteria; during rough and stormy weather sea air is charged with a minute quantity of bacteria. 4. The air of ships' cabins is also charged with a number of microbes incomparably greater than that of the open air at sea, but the purity of the air of these cabins increases rapidly during the first days of the voyage. Later on, an equilibrium appears to be established, depending on the amount of purification of the air by ventilation and the number of occupants. 5. The air of ships' cabins is relatively very poor in bacteria; these probably are one hundred times less in number than the air of an occupied room in Paris.

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ENGINEERING INVENTIONS.

A condenser has been patented by Mr. Richard T. Isbester, of Chattanooga, Tenn. It consists of a novel construction and arrangement of connected compartments and steam and water pipes, the steam pipes passing through fresh water pipes and compartments in such way that the apparatus is very compact, and adapted for effectively abstracting the heat from any fluid or gas.

A coal and ore car has been patented by Mr. Lester J. Barr, of Ashland, Wis. It has a hopper supported by a truss frame, with two sets of dumping doors in the bottom, operated by rods extending through cross bars at the top of the car, the construction being such that the cars will carry a maximum load, and no manual labor will be required in discharging a car of its contents.

A rotary steam engine has been patented by Mr. William F. Lawrenz, of Duluth, Minn. It consists of a concentric disk and shaft, with a valve provided with inlet, outlet, and reversing ports, and devices to operate the valve from the main shaft, the engine being simple in construction and direct in its action, while it can be reversed at any point of its stroke.

A car coupling has been patented by Mr. James B. Force, of Portville, N. Y. The drawhead has a horizontally ranging link socket with a downwardly and backwardly inclined floor, a vertically ranging slot crossing the socket, and other novel features, making a coupling which can be adjusted from either side or the top of the car, and which may be readily used in connection with cars having the common link and pin coupling.

AGRICULTURAL INVENTION.

A corn planter has been patented by Mr. Robert W. Jordan, of Mount Sterling, Ala. Combined with a beam and drive wheels at its rear is a hopper, and semi-cylindrical feeder secured to a crank shaft journaled in the hopper, with other novel features, making a planter with which the seed will be dropped with certainty and which can be readily adjusted to work deeper or shallower in the ground.

MISCELLANEOUS INVENTIONS.

An attachment for cooking stoves has been patented by Adile C. Philippi, of New Orleans, La. It consists in a frame fitted to the stove top, and extending beyond the sides and ends of the stove, in position to form a support for cooking vessels.

A churn has been patented by Mr. William S. Smith, of Salem, Ore. This invention provides a churn dasher operating mechanism applicable for use with almost any form of churn, whereby an exceedingly high rate of speed may be imparted to the dasher rod.

An animal trap has been patented by Mr. Arvor A. Taubeneck, of Marshall, Ill. This invention consists of a trigger engaging a bell crank lever held in a locked position by jaws operated by means of a spring, making a device adapted for entrapping wild ducks, geese, and other fowl.

A pie lifter has been patented by Mr. Edward T. Bradbury, of Mahanoy City, Pa. It consists of wire tongs formed of a single piece of wire, with a spiral in the middle of its length acting as a pivot to the arms of the tongs, the ends of the tongs having oblong eyes for receiving the edges of the plate.

A bedclothes holder has been patented by Mr. Henry O. Thomas, of Fremont, Neb. It is a clamp made of spring wire, with a hook, adapted to embrace and clamp the clothes, and another adapted to engage with a bail, by which the clothes will be held down firmly without mutilating or tearing.

A washing machine has been patented by Mr. William B. Reaves, of Friar's Point, Miss. It consists of a cylinder whose lower end is encircled by a skirt, the operation of a plunger in the cylinder forcing hot suds by atmospheric pressure through the clothes, avoiding all rubbing and mechanical friction.

A freight car lock has been patented by Mr. George J. Bedford, of Anamosa, Iowa. It is a hasp lock, also applicable to any form of door, being designed to operate in a horizontal position, and especially calculated for use in connection with a freight car door, or other form of door that it is necessary to seal.

A button has been patented by Mr. Stephen J. Swayze, of Sag Harbor, N. Y. It has a doubled-faced head in combination with a spring shank, adapted to be attached to a garment without stitching, and to be reversed, so that the same buttons may be used on uniforms to indicate "off" and "on" duty.

An adjustable chair has been patented by Mr. Algeraus C. Watson, of London, O. This invention covers a novel construction of a chair, in which the seat is vertically adjustable on its leg frame, and can be locked at any desired height, the chair being simple, strong, and inexpensive.

A cold chisel has been patented by Mr. Cornelius J. Phillips, of New York city. It is especially designed for plumbers' use in making openings in pipes, and has one or more shoulders above the bit, whereby an opening formed by the bit may be easily enlarged with the same tool.

A photographic camera has been patented by Mr. Erastus B. Barker, of New York city. This invention covers a construction whereby, through the aid of suitable mechanism, both the body and bellows can be readily detached from the running gear and front or lens holder support, and another body and bellows, either larger or smaller, be substituted.

A wire fence machine has been patented by Mr. William J. Raymond, of Cherry Vale, Kan. It has vertical standards and wire twisters on a truck, with beater arms, sliding bars, and an angle lever, and other novel features to facilitate building fences with twisted wires and pickets or rods held by the twisted wires.

A method of starching washed goods has been patented by Mr. Ernest A. E. Meyer, of Watertown, N. Y. It consists in building up within a suitable stationary receptacle alternate layers of hot starch and the goods to be starched, and then driving or heating the starch into the goods by mechanically pounding the whole mass within the receptacle.

A book holder has been patented by Mr. Joseph H. Paradis, of Amherstburg, Ont., Canada. It is a simple device for holding open books of different sizes, with bent wires mounted to turn in a base, bent tubes held on the upper ends of the wires, with two covers, whereby the book will be balanced and the holder work easily.

A reclining chair has been patented by Messrs. John W. Boggs and Daniel M. McLaughlan, of Albina, Ore. It is so made that the inclination of the side posts may be readily adjusted to suit the convenience of the person occupying the chair, and thus fixed by locking clamps, the details of construction being extremely simple.

Feed work for sawmills forms the subject of a patent issued to Mr. Benjamin E. Sergeant, of Greensborough, N. C. This invention provides a variable friction feed for the forward and backward motion of the carriage, employing but one lever to give the movements, and this lever designed to have only a forward and backward movement.

A horse tail supporter has been patented by Mr. William V. Ramsey, of Flemington, N. J. It is made with a plate having stationary jaws upon its rear sides, and with movable jaws and hand clamping screws, whereby the long hairs may be conveniently held up, the jaws being faced with rubber, that they may not injure the hair.

A machine for rolling horseshoe blank bars has been patented by Mr. John H. Snyder, of Richmond, Va. This invention covers improvements on a former patented invention of the same inventor, whereby the heel portions of the shoe are upset or narrowed and thickened, as desired, with other novel features.

A work box has been patented by Mr. John W. Hoffman, of Creston, O. Combined with a box or casing having thread passages and spool supports is a removable tray for various articles used in sewing and fancy work, withcutters secured to the box, with openings to receive tags and indicate the kinds of thread.

A rein holder has been patented by Mr. Harold Gooch, of Bonham, Texas. It consists of a standard having clamp screws for attaching it to the dasher, and carrying a stationary and a movable cylinder, between the toothed faces of which the reins are held, so that any forward tension on the reins makes the movable wheel hold them more firmly.

A saw has been patented by Mr. George N. Clemson, of Middletown, N. Y. It is provided with alternate layers of long and short teeth, the teeth of each pair being set in opposite directions, the design being that the long teeth shall do the cutting and the short teeth serve as cleavers, and for preventing the saw from catching in and splintering the work.

A tricycle has been patented by Messrs. Martin M. and William B. Depuy, of Rowland, Pa. Crank arms are attached to the journals of the drive wheel, and jointed levers are fulcrumed to hangers attached to the frame and connected with the crank arms and with hand levers, in such way that the tricycle can be driven at great speed.

A combined wagon seat and feed trough has been patented by Mr. Lenson Johnson, of Vincennes, Ind. In connection with a seat of ordinary construction a board of substantially the same form as the back of the seat is fitted to slide between cleats near the front of the seat upon the innersurface of its ends, thus converting the seat into a feed trough.

A wire twisting machine has been patented by Mr. Bertram Fulford, of Shelbyville, Ind. It is for twisting wire in making fences, and consists of a board provided with rack, segmental gear wheel, pinions, and a crank arm, the apparatus holding the wires open to permit of inserting pickets, and being moved forward each time a picket is inserted.

A gate has been patented by Mr. Phylander S. Tipton, of Anson, Texas. Its construction is such that an approaching vehicle depresses a trip bar, which operates a mechanism whereby the gate is swung open away from the vehicle, and when the vehicle has passed through the gate a holding latch is released, and the gate swung to a closed position.

A clothes line has been patented by Mr. Thomas F. Durand, of New York city. This invention covers, in combination with pulley blocks and an ordinary line, a novel description of clamp for joining one end of the line with a straight main portion, in order to make greater lengths of line available with a less number of pulleys than are usually required.

Show window shelving forms the subject of a patent issued to Mr. William Oswell, of Boston, Mass. The invention consists of upright supporting posts pivoted at the base, combined with shelves, the posts and shelves having correspondingly placed lugs, connected together by pivots through the lugs, making a series of shelves readily movable, so they will all be in the same vertical plane.

A horse detacher has been patented by Messrs. Franklin Thomas and George M. Kay, of Letart, West Va. This invention relates to a single tree wherein the traces are held by spring hooks adapted to be easily withdrawn from the traces, for detaching the horse, in case he becomes unmanageable, which is readily effected by pulling upon a cord provided for the purpose.

An umbrella drip cup has been patented by Mr. David F. Taber, of Atlanta, Ga. It is a flexible rubber bag or receiver, having at one end a soft rubber cup adapted to receive the tip of the umbrella stick, and at the opposite end a rigid funnel, with means for retaining it on the end of the umbrella stick in position to receive the dripping water, the device being readily applied and removed.

A vehicle seat has been patented by Mr. George E. Bartholomew, of Brooklyn, N. Y. This invention relates to vehicles in which it is desirable that the back seat should be free to swing outward to form an opening in the box, and provides a construction whereby the seat is firmly held and prevented from sagging in its open or extended position.

A vehicle running gear has likewise been patented by the above inventor, who has devised a construction whereby the ordinary form of platform spring is dispensed with, as is also the reach by which the springs are connected, the invention being an improvement on a form of gear heretofore patented by the same inventor.

A spoke fitting machine has been patented by Messrs. Joseph H. Mueller and Joseph Marx, of Cross Plains, Wis. A reciprocating plane is so mounted on a supporting frame, with adjustable clamping device, that the outer end of the spoke can be securely held, whatever its length, width, thickness, or inclination, making a machine to bring spoke tenons quickly and accurately to the required size.

A pneumatic device for discharging firearms, etc., has been patented by Mr. Otto Straube, of Spandau, Germany. It consists of an elastic or collapsible chamber or receiver adapted to be expanded by compressed air, with an air forcing device and devices for striking the fulminate or cartridge, with means for attaching the receiver to a firearm to act upon the trigger.

A revolving mould for casting tubes has been patented by Mr. George Adams, of Waterbury, Conn. Its construction is such that a perpendicular mould, with bowl above it into which the molten metal is poured, and the core rotate in unison to make a solid casting, the device being such that the casting can be easily removed, and being especially applicable for casting seamless copper and other tubes.

A supporting frame for carriage tops has been patented by Messrs. Edward Carroll and Patrick Ryan, of Guelph, Ont., Canada. Combined with a vehicle seat to which are secured flanged wear plates and channel irons is a swinging frame, sliding irons, pivotal and clamping connections, and other novel features, the invention being an improvement on a former patented invention of the same inventor.

A sled brake has been patented by Mr. William Andrews, of Buffalo Grove, Iowa. A rod and guide case is so connected with a runner and a brake shoe as normally to hold the shoe out of braked position, but the parts are independent of the draught devices, and so the brake may be applied at will, it being strong and serviceable, and adapted for use on sleighs of different sizes.

A grain silo has been patented by Mr. Celestin Engrand, of Marseilles, France. It consists of compartments having at their upper ends necks with hoppers, with outlet pipes connected to their bottoms, pneumatic pipes connecting with the compartments, and a layer of non-conducting material surrounding each compartment, whereby grain can be kept at a low cost for a long time.

A screw cutting machine has been patented by Mr. Chester A. Weller, of Croton Landing, N. Y. It is simple in construction, operates rapidly, and designed to produce perfect screws of different kinds as well as for twisting metal rods, the machine having a sliding carriage in which movable screw cutting tools are held, levers being pivoted on the carriage and acting on the movable holders for the screw cutting tools, with fixed cams acting on the levers, and other novel features.

A drier has been patented by Mr. Harry P. McDonald, of Louisville, Ky. It consists of a room whose walls are made of wooden frames, to the inside and outside of which canvas is applied, the latter being painted with silicate of soda or other fireproof material, whereby a great degree of difference of temperature or moisture may be maintained in a room or box so made without affecting the integrity of the inclosing surfaces.

A vapor bath has been patented by Carrie Aurelia Munro, of Olive Branch, O. The body of the bath is made in three separate sections, at the top of the main one there being an opening, so that the head of the person taking a bath may be outside the bath, and the smallest section having a vapor generator, intended to hold water and any desired medicament, the bath being adapted for stowing in small space when not in use.

A snap hook for harness and similar uses forms the subject of two patents issued to Mr. Thomas T. Morrow, of Caro, Mich. In one form the tongue is made in the segment of a circle so the hook may have a slight lateral play without being opened, while another form consists of a loop and hook pivoted together so that the strain in the line of draught will tend to close the hook and make it bear constantly upon the tongue, the construction in both cases being simple and the use of springs entirely avoided.

An electric connection for chandeliers has been patented by Messrs. John P. Willets, of Jersey City, N. J., and Edwin R. Crolius, of New York city. It consists of insulated metallic rings, so held in yielding electric communication with wires carried by the swinging portion of the chandelier as to maintain an electric connection between the main line wires and the lamps, and also furnishes an auxiliary bushing of insulated material, insulating the chandelier from the gas supply pipes.

A hame fastener has been patented by Mr. Daniel B. Baker, of Rising Sun, O. It consists of two metallic straps, one with teeth and the other with a double armed swinging lever, carrying a pin adapted to be engaged by the teeth of the first strap, the lever and its strap being so formed and proportioned that the lever will fold within the strap when moved to a position to lock the hames upon the collar, the device being quick of adjustment, and doing away with ordinary straps and fastening devices.

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NEW BOOKS AND PUBLICATIONS.

EIGHTEENTH AND NINETEENTH ANNUAL REPORTS OF THE TRUSTEES OF THE PEABODY MUSEUM OF AMERICAN ARCHÆOLOGY AND ETHNOLOGY. Cambridge, 1886. Pp. 128.

The Peabody Museum is established on a small foundation, but by careful husbanding of its resources and by receiving subscriptions in aid of its work, has amassed a very valuable collection. The labors of its officers are well illustrated in the Curator's annual reports. Two of these are given, one for 1884 and one for 1885, in the present pamphlet. The system has been to collect as far as possible connected relics, in order to preserve the associations of different objects, and not merely to accumulate surface relics. This is really the key of their work. In the Curator's report for 1884, an interesting document is presented in a copy of a letter from Miss Alice C. Fletcher that accompanied her committal to the care of the Museum of the belongings of the sacred tent of war of the Omahas. A report by Dr. William F. Whitney on the diseases of the bones of the aboriginal races, as revealed by their remains, is quite a curious document, treating the subject of the diseases of these long extinct natives of our country. An illustrated description of explorations in Ohio, by C. L. Metz and F. W. Putnam, is of great interest, especially in its account of the curious ear ornaments of the early aborigines, a species of rude jewelry composed of native copper and silver, and found in tombs with the Indians' remains. The indications of woven fabrics in the same tombs are very curious and reasonably certain. A second report for 1885 of the Curator comes next, in which the systematic system is again forcibly insisted upon. Notes of the Curator's own explorations in the interest of the Museum are given. His allusion to the specimen cases of the Museum is interesting. They are built of cherry and simply oiled. Their interiors are painted light blue, with the happiest results as regards saving the eyes of the student from the white glare usual in museum cabinets. So successful have been these cases that many institutions have copied from them.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Queries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(1) Oriental asks: If a certain coal yields by analysis, say 10,000 feet of gas per ton, will the large meter at a gas works register that amount in actual practice, and, if not, about what percentage less? A. If analysis is correct, it should give the same result on the manufacturing scale measured by the station meter.

(2) M. C. A. asks: Will you kindly answer in your valued paper, SCIENTIFIC AMERICAN, if the burning of casks that have contained bleaching powders (hypochlorite of lime) or soda ash would be detrimental to the ordinary boiler, or the iron stacks with which the boiler is connected? Sometimes the casks are left exposed to the weather for a week before burning. A. We would advise you not to use bleaching powder casks. The soda ash casks would do harm if they formed incrustations on the tubes or fire sheets, which, when the boiler was cold, would attract moisture and corrode it. It would be better policy to use neither.

(3) W. C.—A good way to line a long shaft by the boxes is to set up a true carpenter's level on a couple of light yokes or frames nailed to the beams, so that the top of the level will be at the proper level of the center of the shaft. Cut a card board disk the size of the shaft and place in the box of the end hanger and adjust the hanger to the sight range across the level, then adjust the hanger at the other end in the same manner. The end hangers being on a level and in their proper horizontal position, all other hangers may be readily adjusted by a sight range through the boxes. A stretched line is proper for horizontal adjustment. The spirit level adjustment along a line of shafting already in place is proper, but rather tedious. A set of 3 or 4 hooks to hang on the shaft, all of exactly the same length and projecting below the pulleys, one at each end, the others moved along to different sections of the shaft, with a line sight along their ends, is a quick way of bringing each section to its proper level. A line shaft may be connected to the engine shaft with a flexible link with propriety, where there is requirement for such connection, and the line shaft is subject to flexure.

(4) C. F. W. asks a recipe for Florida water. A. Take 2 drachms each of the oils of lavender, bergamot, and lemon, 1 drachm each of tincture of turmeric and oil of neroli, 30 drops oil of balm and 10 drops oil of rose, mix the above with 2 pints deodorized alcohol.

(5) C. A. H. asks: What are the ingredients and the method of making a fulminate that will explode from a sharp blow. The article was used a few years ago to cover over a target ball, which, when hit with shot, exploded, emitting a flash and smoke. Could it be made and kept in a liquid state, to be used when required? Where can we learn more in regard to this matter? A. Such a mixture might be prepared with chlorate of potash and sulphide of antimony or copper. The proportions would vary, and we would advise you to examine some of the numerous receipts given for the preparations used in the manufacture of parlor matches. A number of these you will find in the "Techno-Chemical Receipt Book," which we can send you for $2.00. The color can be imparted by using the materials generally employed in the manufacture of colored lights. Such a mixture could be made in paste form, like paint, so that it would be available when desired.

(6) H. L. F. desires (1) a recipe for a compound that will harden wood, preventing it from splitting or cracking. A. Wood steeped in a solution of iron sulphate or copperas becomes very hard and almost indestructible. 2. What will permanently and without injury remove superfluous hairs on a lady's face? A. There are numerous depilatories, such as a strong solution of barium sulphide made into a paste with powdered starch. We believe all depilatories likely to prove effectual are liable also to injure the skin. See also "Removal of Hair by Electricity," in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 176 and 353.

(7) J. A. S. asks the preparation used by dentists in cleaning tartar from the teeth and the mode of using it. A. Take of dry hypochlorite of lime ½ drachm, red coral 2 drachms, triturate well and mix thoroughly. This powder is employed in the following manner: A new brush is slightly moistened, then dipped in the powder, and applied to the teeth. A few days' use of this powder will produce a marked alteration in the appearance of the teeth.

(8) L. W., Jr., desires receipt for making solder that will mend tinware without the use of acid or the soldering iron. A. This is probably what is called bismuth solder, and may be made by melting and mixing 40 parts tin, 20 parts lead, 40 parts bismuth by weight, and run into small bars by pouring from a perforated ladle while drawing the ladle across a flat piece of iron, stone, or board.

(9) H. J. W. asks: 1. Why does oil lubricate machinery? A. Because the oil keeps the surfaces from touching each other. 2. My showcase has become worn by contact with articles passing over it. Is there anything that will restore its brilliancy? A. You can partially repolish the glass by rubbing it with rouge on a piece of buckskin. Wet the rouge.

(10) B. O. G. asks how to polish tortoise shell. A. After the tortoise shell is scraped perfectly smooth and level, rub it with very fine sandpaper or Dutch rushes; repeat the rubbing with a bit of felt dipped in very finely powdered charcoal with water, and, lastly, with rotten stone or putty powder; and finish with a piece of soft wash leather, damped with a little sweet oil; or still better, rub it with subnitrate of bismuth by the palm of the hand.

(11) L. B. H. asks: Will a pump lift as large a quantity of water from a well 20 feet deep as it will force 20 feet high? In the latter case the water is supposed to flow into the pump. A. Other things being equal, the difference will be in favor of forcing the water 20 feet with no suction. Water contains more or less air, which is liberated in the partial vacuum formed in the pump suction. This air enters the pump in a rarefied state and displaces some of the water; consequently, the pump is unable to deliver an amount of water equal to the actual displacement of the piston. If the suction pipe leaks even a small quantity, the difficulty will be increased. When the water is delivered to the pump and no vacuum is formed, the cylinder will be entirely filled with water, which must be displaced at each stroke of the piston. Consequently, the full capacity of the pump will be realized.

(12) C. L. B. asks a receipt for softening steel, so it can be worked up easily (to make letters, figures, and all such tools). A. Steel can be decarbonized by placing it in an iron box of pulverized hematite and heating to a low red for a few hours, and may afterward be recarbonized by again heating in the iron box filled with horn, leather, or shavings, and pulverized charcoal. We do not recommend the process for letter or figure punches, and unless you have experience in such work you may make discouraging failures.

(13) D. L. P. —There is no difference in value of the readings of an aneroid and mercurial barometer with their corrections applied. English barometers of both kinds are marked in inches. The French barometers are marked in millimeters. You have possibly confounded millimeters and French lines in your reading. Aneroid barometers are not reliable.

(14) F. E. O. asks (1) how to protect an iron abutment post of a bridge from rusting in contact with the earth above the water line, below water, and when alternately wet and dry. A. Cover with a coat of asphalt or coal tar, and then surround with pure Portland cement. The part of the post that is subject to wet and dry should be thoroughly cleaned and painted with two coats Prince's metallic paint in boiled linseed oil. 2. A simple way of repairing a rubber boot that has half an inch square of the rubber coating peeled off the linen. A. Use rubber cement to cover the peeled patch, two or three coats.

(15) K. B.—We know of no better way of cutting marble than that practiced by the marble sawing trade. Make your saw of thin sheet iron, no teeth, size of a common wood saw, and fit it into a wood saw frame and work the saw forward and back on the marble, with fine sharp siliceous sand and water, plenty of each. It is slow work, but the best that we can do.

(16) D. F. writes: In your issue of July 31, in answer to my question as to what steam pressure on a boiler was equivalent to a cold water pressure of 120 pounds, you reply "75 pounds allowed." A boiler maker insists that although but 75 pounds pressure is allowed, the 120 pounds cold water pressure is equal to 240 lb. pressure. He says that water is not as elastic as steam, and that cold water pressure is equal to double the same number of pounds steam pressure. Will you answer more fully? A. Your boiler maker labors under a very erroneous and dangerous impression. The pressure is exactly the same, whether produced by water or steam, but water or hydrostatic pressure is not dangerous in case of rupture, while steam pressure is.

(17) S. M. Mc. C. asks how much crude cottonseed oil weighs a gallon. We calculate it at 7½ pounds, but at what temperature should it be, as oil expands and contracts as it heats or cools? A. For the summer yellow cottonseed oil, the actual weight at 60° Fah. is 7·6592; and for the crude, 7·6683.

(18) H. A. F. asks: How can I make canvas perfectly waterproof so as to be suitable for a canoe covering, and also that it will not crack when folded in small space? A. Use a solution containing equal parts by weight of gelatine and bichromate of potash. It is not advisable to mix more of the solution at once than is sufficient to give the canvas one coat, as, if the mixture once sets, it cannot be reliquefied like a plain solution of gelatine; and hence, if the quantity of canvas to be waterproofed is small, it would be preferable to coat with plain gelatine solution until quite impervious to cold water, and then to thoroughly soak, say for 24 hours, in a strong solution of bichromate of potash. You might try melted paraffine applied to perfectly dry canvas.

(19) G. M. P. writes: I have a heating stove, the body of Russia iron. It is spotted with rust. Can I use nothing better than common stove polish on it? A. Use the following: Take of asphaltum 2 pounds, boiled linseed oil 1 pint, oil of turpentine 2 quarts. Fuse the asphaltum in an iron pot; boil the linseed oil and add while hot, stir well and remove from the fire. When partly cooled, add oil of turpentine. Some makers add driers.

(20) T. A. S. asks: What is the best mode of removing the strong odor from meerschaum without destroying the color? A. The stem of the pipe may be cleaned by passing alcohol through it. Care must be taken, however, to prevent the solution from getting on the outside of the pipe, as it tends to destroy the coloring.

(21) W. H. S. asks: What can I mix with turpentine, or what liquid can I mix with good drier, to bronze? A. Apply a coat of good copal varnish, and before the latter is entirely dry dust over the bronze powder by means of a soft brush. To avoid unnecessary loss, place the article on a sheet of clean white paper, so that superfluous bronze powder can be saved.

(22) C. F. S. writes: Can you give me a receipt for a cheap, dark green stain suitable for roofs? Must contain nothing that would render the water unfit for use. Also dark red stain possessing the same properties. A. For the green stain, use turpentine with a very little raw linseed oil colored with yellow ocher and black; for red, use any oxide of iron paint. You may try crude petroleum instead of turpentine and oil.

(23) E. F. H. asks (1) how to make that yellowish kind of lacquer, such as opticians use on lenses and like instruments. A. Take equal parts of gum mastic and white shellac, and dissolve in alcohol, then add half a teaspoonful of glycerine to a pint of the mixture. Then color, by adding, drop by drop, aniline yellow, soluble in alcohol, until the proper shade is obtained. 2. The process by which the brass of same is blacked so as not to be rubbed off by friction. A. Make a strong solution of nitrate of silver in one dish and of nitrate of copper in another. Mix the two together, and plunge the brass in it. Now heat the brass evenly until the required degree of dead blackness is obtained.

(24) J. D. W. C. writes: I have a military decoration, in the shape of an iron cross with silver trimmings. Will you tell me what I can do to the iron to prevent rusting, without disguising the material or injuring the silver? A. A thin coat of copal varnish will probably accomplish your object. Linseed oil is also used for this purpose.

(25) C. H. F. asks for a method of polishing ivory. A. Rub first with fine glasspaper, and then with a piece of wet linen cloth dipped in powdered pumice stone. The final polish may be produced by washed chalk or fine whiting applied by a piece of cloth wetted with soap suds.

(26) G. C. W. asks: 1. What will soften hard water and not damage clothes? A. If the water is not permanently hard, the hardness can be removed by the addition of milk of lime or by boiling. 2. What is the best method to wash real lace curtains? A. Soak and then gently agitate them in tepid soap suds, two or three different waters if necessary; then rinse in cold water, and gently open out to dry on a white table cloth in the open air. 3. Can you refer me to any authority upon table setting and serving? A. See Miss Parloa's New Cook Book, which we can send you for one dollar.

(27) J. F. H. writes: A cast iron weight has accidentally fallen into a cask of pure cider vinegar, discoloring the same. What shall I do? A. Place some charcoal in your cask, and stir from time to time. We doubt if you will satisfactorily accomplish your end.

(28) Gyp would like to know (1) how to make a good, hard cement for bone and ivory. A. Use white wax, resin, and oil of turpentine, melted together at a moderate heat, so as to form a thick, fluid mass. If the cement is to be colored, finely powdered coloring substances, as red lead, ultramarine, etc., are to be added. 2. How to polish amber. A. By friction with whiting and water, and finally with a little olive oil laid on and well rubbed with a piece of flannel, until the polish is complete.

(29) C. N. desires a receipt for making koumiss—one that can be used for making it at home. A. Koumiss is prepared by dissolving 4 ounces of white sugar in one gallon of skimmed milk, and placing in bottles of the capacity of 1 quart; add 2 ounces of baker's yeast or a cake of compressed yeast to each bottle. Cork and tie securely, set in a warm place until fermentation is well under way, and lay the bottles on their sides in a cool cellar. In three days' fermentation will have progressed sufficiently to permit the koumiss to be in good condition.

(30) C. G. C. asks: Is there any way to preserve insects in a dry state, such as beetles, flies, spiders, etc., for microscopic purposes? A. They may be preserved by dipping in a solution of corrosive sublimate. This is, however, extremely poisonous, and great care must be taken in its use. Dipping them in melted paraffine would preserve them from contact with air.

(31) F. P. says: I have a sugar mill (cylinders 27 inches by 42 inches) now running eight revolutions per minute; can change to four with little cost. Shall I get more saccharine matter out of the cane, running slow? If so, please say why, and how. The slower motion would give greater compression to the cane, and would no doubt add to the product of the cane juice by allowing more time for expression, as it is a well known principle that time adds to the product, as practiced in the production of linseed and cottonseed oil, also in the expression of fruit juices. How much we could not say, as we have no practical experience here with sugar mills.

MINERALS, ETC.—Specimens have been received from the following correspondents, and have been examined, with the results stated.

E. B.—Both specimens are ordinary clays, colored with oxide of iron, and in the vicinity of New York such material is known as Jersey mud.

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Water wheel, J. L. Perley..... 348,997
Weaner, calf, H. L. Jones..... 349,104
Well boring tool, J. A. Woodhouse..... 349,192
Wheel. See Vehicle wheel. Water wheel.
Wick raiser, L. Henkle..... 348,970
Windmill, T. C. Albee..... 349,197
Window, show, C. D. Williams..... 349,290
Wire stretcher, S. W. Harman..... 349,041
Wire twisting machine, B. Fulford..... 349,251
Work box, J. W. Hoffman..... 349,096
Woven fabrics, apparatus for stretching, W. Birch..... 349,139
Wrench. See Ratchet wrench.
Wrench, A. H. Criley..... 349,249

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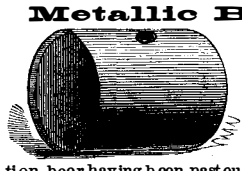

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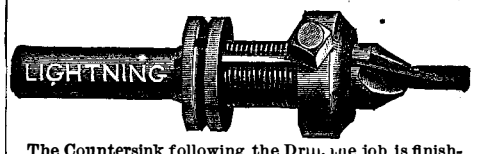

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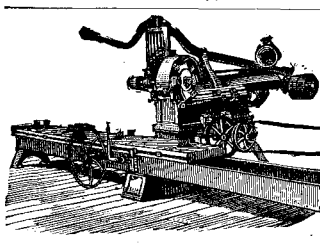

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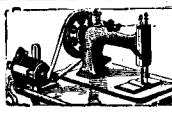

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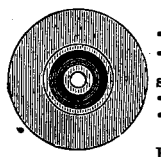

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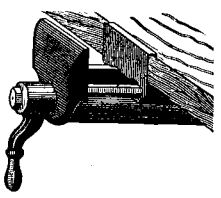

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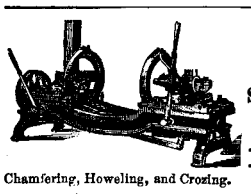

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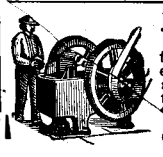

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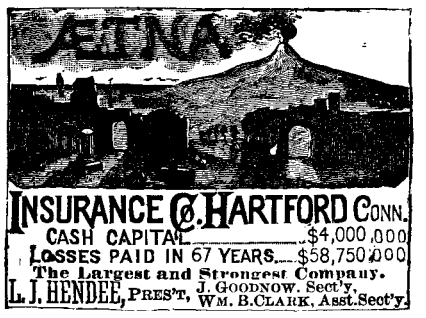
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Notice to Contractors.—Filters.

Sealed bids for the construction, in the City of Cheyenne, Wyoming Territory, of a system or process of filtration adapted to the purification of the water supply of the city, will be received at the office of the City Clerk of said city until 7 o'clock P. M. of Friday, October 8, 1886. Bids should be for a plant supplying 1,000,000 gallons and also for a plant supplying 1,500,000 gallons in twenty-four hours. A guarantee for the perfect working of the system will be required. The system or process is to be constructed and operated to the satisfaction of the Council Committee on Waterworks. Bids should be indorsed: "Proposals for the Construction of a System of Filtration for the City of Cheyenne, Wyoming." Bids will be opened at the City Hall in the evening of above date.

The City Council reserves the right to reject any or all bids.

Description of water-works and sample of water sent, on application to

WM. G. PROVINES,
City Engineer.

TO THE STEEL MANUFACTURERS OF THE UNITED STATES OF AMERICA.

UNITED STATES NAVY DEPARTMENT,
WASHINGTON, D. C., Aug. 21, 1886.

The attention of all steel manufacturers of the United States is hereby invited to the requirements of the Navy Department in the way of armor-plates and heavy gun forgings, for the prosecution of work already authorized by Congress.

This advertisement invites all domestic manufacturers of steel to specify, in competition with each other, upon what terms they will engage to prepare for the production of and produce the forgings and armor-plate required for modern ordnance and armored ships; and no bids will be considered except such as engage to produce within the United States either all the gun-steel or all the armor-plate (or both) specified in this advertisement; nor will any bid be accepted unless accompanied by evidence satisfactory to the Department that the bidder is in possession of, or has made actual provision for, a plant adequate for its fulfillment.

Bids are hereby invited for supplying this Department with the under-mentioned material:

About 1,310 tons of steel gun-forgings, of which about 328 tons will be for guns of six inches caliber, 70 tons for guns of eight inches caliber, and 912 tons for calibers between ten inches and twelve inches (both inclusive).

These forgings are to be delivered rough bored and turned, and when in that state the heaviest forging which enters into the construction of a gun of each of the desired calibers will be about as follows:

6-inch	2¾ tons.
8 "	5 "
10 "	9½ "
10½ "	9¾ "
12 "	12½ "

All these forgings must be delivered within the following times from the closing of a contract, viz.:

For 6 inch guns, 28 within one year, and the remainder within 18 months.

For 8 inch guns, within two years.

For 10 inch and larger guns, within 2¼ years.

Preference will be given for earlier deliveries.

Also, about 4,500 tons of steel armor-plates, to be of the best material and manufacture, shaped accurately after patterns to fit the form of each vessel for which intended, and of such sizes as may be required, varying somewhat as follows:

20 feet by 8 feet by 12 inches thick.
17½ feet by 6 feet by 17 inches thick.
11½ feet by 4¼ feet by 6 inches thick.
There will also be thinner plates.

For information concerning shapes and weights of the gun forgings and armor-plates, what parts must be manufactured in sets, time of delivery of each set, the chemical, physical, and ballistic tests, which the metal must sustain in each case, and for all other particulars, apply to the Chief of Bureau of Ordance, Navy Department, Washington, D. C.

Each bid upon armor-plate must specify the time within which the bidder will engage to make delivery; and preference will be given to earliest proposed deliveries.

Proposals must be in duplicate, sealed and addressed to the Secretary of the Navy, Navy Department, Washington, D. C., the envelopes indorsed "Proposal for steel gun-forgings and armor."

They will be received at the Navy Department until 12 o'clock M. on the 10th day of December, 1886, at which hour the opening of the bids will take place.

The right is reserved to waive defects in the form of, and to reject any or all bids.

Ten per cent. of the contract price will be retained from the payment for each article delivered, until the contract, as far as relates to articles of that class, shall have been completed.

Separate bids may be submitted for the gun steel and for the armor, if any manufacturer so desires; but bids covering both will receive preference, other things being equal.

Bids will be compared in two classes.

First. Gun Forgings.

Second. Armor-plate.

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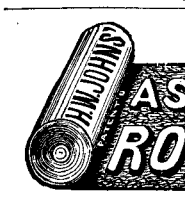

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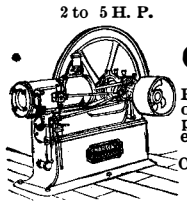

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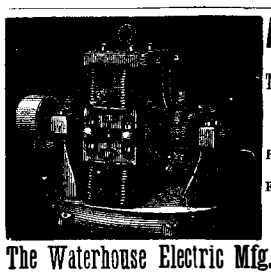

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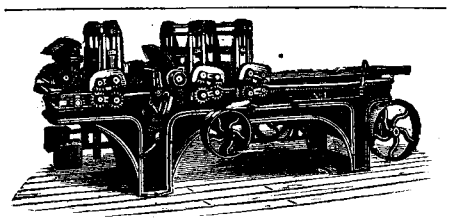

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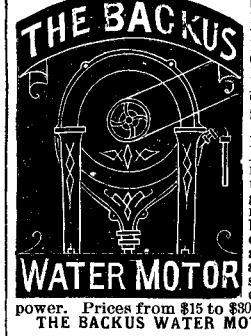

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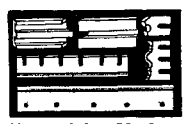

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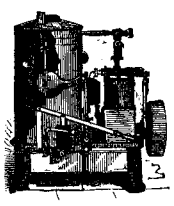

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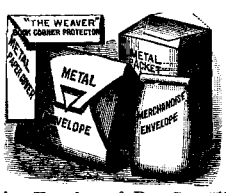

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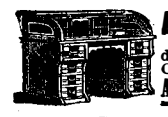

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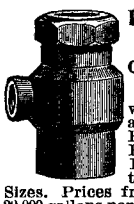

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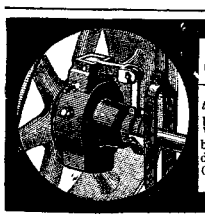
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